ELECTRICAL REVIEW

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House Warming

PRESENT inability to bring to the surface an adequate tonnage of coal, coupled with load shedding (unrelated except for its accentuation by shortage of suitable household coal), has stimulated public interest in methods of domestic heating. Many proposals mooted in the lay Press and elsewhere seek to avoid these troubles by expedients of dubious merit, whether immediate or long-term. At best they suggest mere palliatives, in relation to the magnitude of the need for power, and tend to divert labour and materials from the most practicable means of coping with the situation—that is the rapid commissioning of modern large-output generating plant which can economically use low-grade coal, thus freeing scarce good coals for industry and export. Sometimes advocacy is for the general application of methods that have given good results in inherently limited fields.

At worst, the proposals seek to impose now as a long-term policy, irrespective of consumers' wishes, heating systems as yet untried on a comprehensive scale. Prominence is being given to the heating of residences by solid smokeless fuel which, as Sir John Hacking pointed out at the recent A.S.E.E. dinner, does not even exist in appreciable quantity. Moreover, the gap between the energy consumption for unnecessary continuous heating and that in daily use may be very wide, an instance of which was recently quoted in *The Times* by Mr. E. W. B. Gill.

In the long-term view taken by Mr. D. H. Parry in his I.E.E. paper (reported in our last issue) the crux of the matter is that houses, as now built in this country, are wasteful of heat to an extent found nowhere else. For an additional cost—small in relation to the value of the heat energy saved—he shows that they could be designed to meet the conditions of, say, 50 years hence, when raw coal may be too expensive for domestic use and, we surmise, when atmospheric pollution (not only smoke) is less likely to be tolerated. Mr. Parry's views are admittedly tentative with regard to their

practical applications, but the electrical industry might well take the initiative in exploring their possibilities. An important long-term factor was mentioned by Mr. V. W. Dale in a recent letter to *The Times*. It is that electricity is the only single-purpose medium that meets all domestic lighting, heating and power requirements and provides the only known means of ultimately distributing atomic energy.

RIPARIAN RIGHTS

Grave difficulties confront the British Electricity Authority as a result of the decision of Mr. Justice Harman that the discharge of cooling water from the Spondon power station into the River Derwent must no longer be allowed to injure the fishing rights owned by the plaintiffs in the case. The Authority's counsel stated last week that the cost of equipping the station with a self-contained cooling system would be upwards of £400,000. Moreover this instance may be regarded as a precedent for later similar actions. The case has shown that private rights (which of course must be protected) may seriously handicap a vital public service. One possible way out is to ask the owners of such rights to surrender them for fair compensation. Complications were present in the case in question; the effluents of the B.E.A.'s co-defendants were of quite a different character.

TRANSATLANTIC EXCHANGES

Last week we mentioned the end of the arrangement by which parties from this country have been visiting the United States to learn something of American practice and the somewhat limited "reverse flow." We wanted to know how lessons thus learned had been applied. The leader of the American electricity supply team which has visited this country said before the party left that he had noticed a widespread use of small electric tools and mechanical handling which, he assumed, had been adopted as a result of British visits to the United States. In the other direction, he said that his colleagues had been impressed by the B.E.A.'s coal research, its use of inferior coal and by its crack detection methods some of which were in advance of United States practice. British superiority in cable design, the use of aluminium for roofing power stations and of glass in side walls were also mentioned.

ELECTRICAL PLANT INQUIRY

A third "electrical" reference has been made by the Board of Trade to the Monopolies and Restrictive Practices Commission. The first concerned electric lamps on which the Commission issued its report last November; a report on the second reference, electric wires and cables, is to be completed this month. A very wide field will be covered by the investigation now proposed. All but the smallest generators, motors and transformers will form the subject of inquiry and the hearing of evidence by the Commission is likely to take a long time. Special mention of exports is made in the terms of reference.

CLIENTS' REQUIREMENTS

In the April *Electrical Contractor and Retailer* Mr. A. Melvin Turner complains of the burdens placed upon contractors by the rigid specifications of some clients or their representatives. He instances a case where the tendering contractor was required to specify the maker and catalogue number of practically every piece of material to be used, although it would be quite impossible to adhere to such a list. Mr. Turner shows that sufficient safeguard is provided by a clause requiring samples of materials to be supplied for approval. Other irksome and unnecessary requirements are mentioned which add to the small contractor's many worries. The clients' point of view can be appreciated, but no doubt some of them are much too meticulous.

Better Installations

Regulations, Registration and Inspection

It was recognized by the Institution of Electrical Engineers in 1882, just 70 years ago, that some guidance was necessary in connection with the materials and methods to be used for electrical installations, for public electricity supply systems were coming into prominence at that time. Accordingly, on the recommendation of a committee composed of prominent engineers, the Institution issued a code entitled "Rules and Regulations for the Prevention of Fire Risks arising from Electric Lighting" and this was the first edition of what have come to be commonly known as the "I.E.E. Wiring Regulations."

This first edition was short, simple but possibly a little vague as the materials available were limited in type, thus limiting the methods of wiring; even so, the regulations contained in essence the main features of the current edition.

This is a remarkable fact and should be carefully borne in mind by those who criticize the regulations and yet make no proposals for their substantial improvement. It would be impossible to satisfy the ideas of everybody in the wide range from people who abhor regulations of any kind to those who would make the use of electricity impossible by demanding excessive standards for electrical installations.

Controversy regarding control and inspection of electrical installations is of long standing. The author, who wishes to remain anonymous, recounts the history of the subject and gives his views. Interested readers are invited to express their opinions.

In the years that have passed since the publication of the first edition the I.E.E. Council has had the carefully considered advice of successive committees fully representative of all those connected with and interested in electrical installation work who have been as keen to ensure that the regulations are as short and simple to meet all requirements as the critics who are seldom in a position to form a really impartial opinion on the whole subject.

Regulations of the standard and character of those of the I.E.E. for electrical installations must be such as to eliminate as far as possible any loopholes through which an ingenious person might with a little cunning dodge some essential requirement.

Laws are passed to protect the great majority of honest people against the small minority of criminals and the same principle applies to regulations of any kind, and so it is fair and reasonable to regard the I.E.E. Regulations as the proper standard by which all electrical installations should be judged.

Then arises the question as to the means which should be adopted to enforce or otherwise ensure the observance of the regulations: should it be by compulsion, by free will or a combination of both? Should the obligation be on the supply authority, the electrical contractor or the user? The methods applied in the past have been rather haphazard, some a mild form of compulsion, others (and mainly so) have been voluntary.

In the earlier Electricity Acts and Orders made thereunder it was made the duty of the electricity supply authorities to test every new installation to ascertain the leakage current, in other words the insulation resistance, and nothing more. Authorized undertakers were empowered to refuse to give a supply unless they were reasonably satisfied that the electric lines, fittings and apparatus were in good order and condition.

Power was given to the Board of Trade (subsequently the Electricity Commissioners and now the Minister of Fuel and Power) to issue regulations for ensuring the safety of the public. In addition, power was given to all local authorities to adopt bylaws for further securing the safety of the public in their districts. These bylaws had to be approved by the Board of Trade (or its successors).

Finally, it was a punishable offence for

any person to connect any electrical installation to a supply authority's system without prior notice to the authority.

It is interesting to note how these legal vagaries have operated. As to the test for leakage current many supply authorities were content with this minimum legal requirement but some did go a little further and draw the attention of the contractor or consumer to any faulty work or material but without taking any drastic action to secure the rectification of the faults. More consumers and the sale of more units seemed to be a greater objective than a good standard of electrical installation work.

Electricity Commissioners' Regulations

With over 500 supply authorities in the country it was impossible to obtain any co-ordinated and co-operative action in enforcing the I.E.E. or any other regulations for wiring and accessories. The regulations issued by the B.O.T. and subsequently in a revised form by the Electricity Commissioners placed responsibility on the supply authorities and mainly applied to their own systems but there was one important provision in the regulations which empowered authorities to refuse to give a supply and to disconnect any existing installation if they were not reasonably satisfied as to the condition of a consumer's installation.

This provision, in conjunction with other powers, did in effect give the supply authorities all the power they needed to stamp out bad work and materials and it is unfortunate that this power was not fully used. The reason often given for this lack of enforcement was the absence of any standard by which to judge the condition of the installation. Actually this was no valid reason but merely an excuse because another provision in these (Electricity Commissioners') regulations states that a supply shall not be withheld if the installation is carried out in accordance with the I.E.E. Regulations. What more could be desired?

The power of local authorities to adopt bylaws was in respect of their status as local authorities and not as electricity undertakers and could have operated in any area whether the supply authority was a company or municipality. West Ham officially adopted the I.E.E. Regulations as their bylaws and Bradford also adopted some bylaws but their precise nature has never been clearly stated.

No other cases are known of local authorities' bylaws in respect of electrical installations; it would clearly have been an expensive matter, particularly in a company supply area, for a local authority to adopt and enforce bylaws. Moreover, unless the local authorities agreed to adopt one standard set of bylaws it is doubtful if the B.O.T. or the Electricity Commissioners would have approved because of the chaotic condition which would have arisen if different bylaws operated in different parts of the country.

As to illegal connections to an authority's supply system, prosecutions did take place from time to time but they were few and far between, mainly because of absence of proof owing to the difficulty and expense of keeping accurate records as well as the desire to secure increased output and revenue.

It is suggested that, taken collectively, the supply authorities in conjunction with the local authorities had sufficient powers to effectively control the standard of electrical installation work but they hesitated to jump the hurdle.

This negative attitude, however, did not deter other interested bodies and persons from making some effort to reduce or eliminate bad work and material when the general use of electricity made such meteoric progress after the first world war.

The National Register

As a result of representations from various quarters the I.E.E. set up a committee to examine the whole subject and in particular the merits of compulsory *versus* voluntary registration of electrical contractors and operatives.

The outcome was a recommendation in favour of voluntary registration of electrical contractors only, and this recommendation was duly implemented by the setting up of the National Register of Electrical Installation Contractors in 1925.

The Registration Board comprised representatives of all interested bodies with one exception—the electricity supply companies—and this was indicative of their attitude towards any kind of control over electrical installations.

Be that as it may, the National Register made good progress and achieved a high reputation in the industry. Nevertheless,

the progress made did not satisfy the Electrical Contractors' Association and in 1946 it withdrew its support from the N.R.E.I.C. although the E.C.A. of Scotland continued its interest and connection.

It was been generally understood that the reason for the defection of the E.C.A. was the urge of its members to secure compulsory registration and that it weakened their case by continuing to support voluntary registration.

Reference should be made at this stage to other events which occurred about this time. The E.C.A. was a keen supporter of a committee which had been set up by compulsionists to prepare a scheme for compulsory registration and to take the necessary steps for its legal enforcement. This committee did produce such a scheme but the I.E.E. displayed no enthusiasm for it, the Ministry of Works frowned upon it and as support in other directions was lacking the committee decided that no useful purpose could be served by continuing its activities and it so to speak shut up shop.

Nationalization of Supply

Then before the breach between the E.C.A. and N.R.E.I.C. could be healed the Government introduced (in 1947) its Bill to nationalize the electricity supply industry. Everything was then thrown into the melting pot, all were fighting to protect their own interests and anxiously awaiting the pattern which would result from the re-casting of the industry. The British Electricity Authority and Area Boards set up under the Act of 1947 were endowed *inter alia* with complete powers to carry out electrical installation work and so compete with independent electrical contractors. They were also given powers to adopt rules and regulations for the safety of the public.

The N.R.E.I.C., which included a goodly number of supply authorities as registered electrical contractors, was given to understand that these registrations would be continued pending a full consideration of the whole matter by the Central Authority in conjunction with the Area Boards and the two associations of electrical contractors.

Ultimately it was announced that the Central Authority and Area Boards favoured a system of voluntary registration and with this end in view another committee was set up designated "The Organizing Committee" to formulate proposals for the inauguration of a "National Inspection Council for Electrical Installation Contracting." This was over two years ago and so far no official statement has been issued as to the outcome of the deliberations of the Organizing Committee.

However, secrets are only secret when in the possession of one person and one gathers from hints or observations which have been uttered from time to time that the proposed National Inspection Council will embrace all parties interested in electrical installation work, that an adequate number of inspectors will be employed to cover the whole country and that area and local committees will be formed to assist the National Council by "on the spot" reports supplementing the reports furnished by the Council's own inspectors.

The co-operation of Government Departments, local authorities and others will be invoked and the names of all contractors on the roll of the National Council in each district of an Area Board are to be displayed in the district showroom of the Board. If these mutterings prove to be in any degree accurate they should be a very good start and welcomed on all sides. But why the continued secrecy and delay? Why not push on with the good work immediately?

Is there any truth in the further hint that another "Gremlin" is creeping over the shoulders of the Organizing Committee—that the E.C.A. is still hankering after compulsion? Could anything be more foolish or out of date?

Altered Circumstances

Circumstances and conditions have changed out of all recognition since compulsory registration was first voiced. Fifteen Electricity Boards, instead of five hundred authorities, now control the sale of electricity and have power to carry out electrical installation work. Organized labour through trade unions has gained enormous power and control. Is it desirable to still further increase it?

Although the Area Boards can inspect the work of an independent electrical contractor there is no one to inspect the work of unregistered Area Boards. Has anyone estimated the cost of establishing an independent (it must be independent) organization for compulsory registration

of contractors and their operatives, or visualized the delays and restrictions which must inevitably result? The time is long past for any such proposal to be given a second thought. What is the alternative?

Let the National Inspection Council be brought into operation without further delay and with concurrent adoption of a standard code of wiring regulations (preferably the I.E.E. Regulations) to be legally enforceable by all Electricity Boards. of the National Inspetion Council would act as arbiter to ensure that independent contractors are not victimized by their competitors—the Electricity Boards; and there should be prosecution in every case where connections are made without notification to the responsible Electricity Board.

Any electrical contractor not on the roll of the National Inspection Council would be unable to escape inspection of his work by the Electricity Boards except at the risk of prosecution, and for such inspection the Boards could engage the National Inspection Council instead of using their own staff where the circumstances warranted this course of action.

We pride ourselves on being a "free country" but precious little freedom is now left to us and compulsory registration should be resisted to the utmost.

Pollution of the Derwent

Injunction against B.E.A.

MR. JUSTICE HARMAN, in the Chancery Division last week, held that the Pride of Derby and Derbyshire Angling Association and the Earl of Harrington had a good cause of action in their claim for injunctions to restrain British Celanese, Ltd., Derby Corporation, and the British Electricity Authority from polluting the Rivers Derwent and Trent.

For the British Electricity Authority, Mr. Henry Salt, Q.C., said that at least four years would be needed to deal with the question. The cost of converting the Spondon power station to a self-contained cooling system would be upwards of £400,000 and there would have to be a series of schemes. Referring to the returning of water to the Derwent after being used for cooling at the power station, Mr. Salt said that if the Authority were driven to comply with an injunction which allowed it no latitude in temperature, it was not impossible that it might have to shut the station and the grid system could not make good the extra strain.

Mr. G. H. Newsom, for the plaintiffs, said there was a single amount of damage for which the defendants were severally liable.

His Lordship granted injunctions against all the defendants to be suspended for two years. The first injunction restrained them from allowing or permitting effluents to alter the quality (including temperature) of the Derwent and the Trent. The second was to restrain them from permitting effluents which would interfere with the enjoyment of the plaintiffs or their successors of the fishing rights in their waters.

His Lordship said there would be an inquiry as to damages and these, when certified, would be paid by the defendants in specified proportions. Costs were awarded to the plaintiffs.

Dealing with Derby Corporation's submission that there should be no injunction against them, his Lordship said it had been pleaded that the Corporation had been reasonable and the plaintiffs unreasonable.

The Court would expect a great deal to be done during the two years suspension and would not tolerate any passive attitude by the defendants. If perfection could not be attained in that time, they would not be justified in doing nothing and if they gave a good account of themselves they would be treated with justice. If an extension was needed at the end of two years, there would have to be further proceedings. The defendants would be placed under an undertaking to indemnify the plaintiffs for any continuing damage arising from the suspension of the injunctions.

Halifax E.A.W. Branch

THE Halifax and District Branch of the E.A.W. celebrated its 21st birthday on 24th March; it is the nineteenth Branch of the Association to "come of age." In the chair was the Mayoress (Mrs. Arthur Pickles) who is Branch president. "The Town of Halifax" was proposed by Mr. N. Ashton, A.M.I.E.E., district manager, Yorkshire Electricity Board, and the reply was made by the Mayor, Ald. Arthur Pickles, O.B.E., J.P. "The E.A.W. 21st Birthday" was proposed by Mr. A. E. Elson, commercial engineer, Halifax District, and the response was given by Dame Caroline Haslett, E.A.W. director.

[*Aerofilms photo*

Electricity Supply Arrangements

ON 24th November, 1944, we published an article by Mr. H. Midgley, then city electrical engineer of Plymouth and now deputy chairman of the South Western Electricity Board, describing the electricity supply arrangements which it was proposed to adopt in connection with the scheme for rebuilding the central area of Plymouth after its destruction by bombing in the early part of 1941. Recently we paid a visit to the city to see how this scheme was progressing and also to learn something of other electrical developments which have been carried out since the war in the Plymouth District of the Board (district manager: Mr. N. Axford).

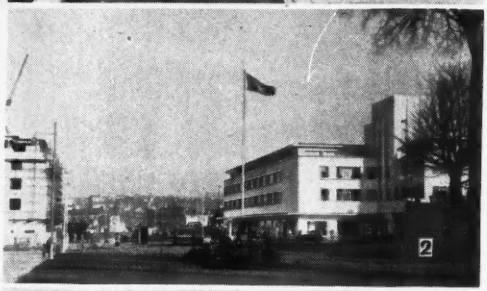
The devastation in the 60 acres covered by the central area reconstruction scheme was so extensive that the city engineer, Mr. Paton Watson, in collaboration with Professor Abercrombie, the consultant, was able to prepare plans for a practically clear site. Only a very few buildings of historical interest which had escaped destruction had to be retained and fitted into the scheme. Other buildings which remained standing were subject to compulsory purchase rights. The new buildings now being erected are being leased for ninety-nine years so that eventually they will revert to the Plymouth Corporation.

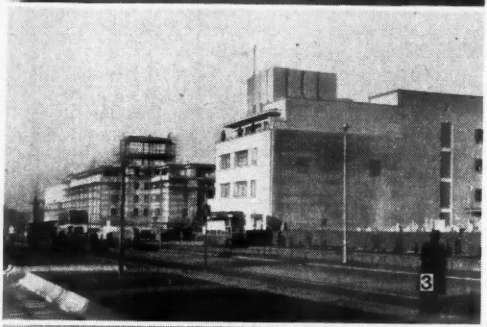
The reconstruction scheme was originally planned for completion within the next ten years and while good progress has been made hitherto it is inevitable that the recent restrictions on capital expenditure and use of materials will involve serious delay.

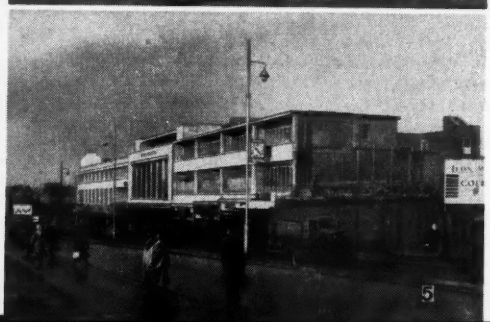
Sufficient progress has, however, already been made to make it possible to visualize the final scheme. New roads have been completed in about half of the area and include a portion of a wide road (Armada Way) which will eventually run right through the centre of the city from the Hoe to near North Road railway station. At right angles to this runs Royal Parade, another imposing road half a mile in length, terminating at each end in large roundabouts. Parallel with Royal Parade is the almost completed New George Street, at the eastern end of which is Old Town Street which runs into one of the roundabouts referred to.

Some buildings have already been opened and others are in various stages of construction. Among the first buildings to be completed was Dingles' Stores (ultimate maximum demand 550 kW) on the corner of Armada Way and Royal Parade. This was followed by a group of shops and offices (150 kW) occupying the other end of the same block fronting on to Royal Parade, Old Town Street and New George Street (this forms the first section of the Norwich Union block); a Dolcis shoe shop (70 kW) adjoining Dingles' in New George Street; another group of shops (280 kW) on the north side of New George Street; and another single shop building (60 kW) in Old Town Street.

The Pearl Assurance building (370 kW) and the first section of the Co-operative Wholesale Society's offices (250 kW) are approaching completion in Royal Parade, while work is already in hand on other shop and office premises (estimated load 440 kW) which will occupy most of the







remaining space in the block bounded by New George Street, Armada Way, and two further new roads not yet constructed, one of which is to be named Cornwall Street.

By the end of March the demand for electricity from the new buildings had reached 1,110 kW and the plans (which will no doubt have to be revised in accordance with the slowing down of the building programme) provide for the demand to reach 2,430 kW by 1953, 7,210 kW by 1956 and 10,940 kW by 1961. Subsequent further development is not expected to be large because all the premises will start with modern installations.

Before the war seven 6,600/346/200 V substations were used to supply the centre of the city. Two of these have already had to be removed during reconstruction work and another two will have to be abandoned. The Athenæum (1,500 kVA) and St. Andrews Street (1,500 kVA) substations will be retained but that at Saltash Street (1,500 kVA) will have to be re-sited when rebuilding work in the vicinity necessitates. A temporary transforming point is in commission in George Lane.

Since the planning of the new roads has been undertaken without any regard to the previous street layout, the existing l.v. network is virtually useless and is having to be replaced. The same applies to a lesser extent to the h.v. cables.

In the original scheme described by Mr. Midgley it was proposed to retain the 6·6 kV system of h.v. distribution and feed it from four 33/6·6 kV primary substations situated more or less symmetrically, each to serve a quarter of the site. Since then nationalization of the supply industry has permitted the planning of electricity supply systems without the limitation of the previous artificial boundaries, and this widening of horizons has facilitated the use of higher distribution voltages. Accordingly in pre-

(1) A portion of Whitley housing estate, one of six new estates developed since the war. A substation is seen on the right

(2) Looking up Armada Way which will form the main thoroughfare from the Hoe to North Road railway station. The cross road at the flagstaff, is Royal Parade

(3) Royal Parade showing Dingles' stores in the foreground and farther down the road the Pearl Assurance and Co-operative Society's buildings in course of construction

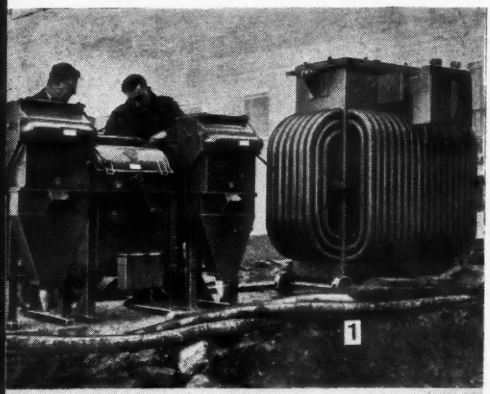
(4) Norwich Union House at the corner of Royal Parade and Old Town Street

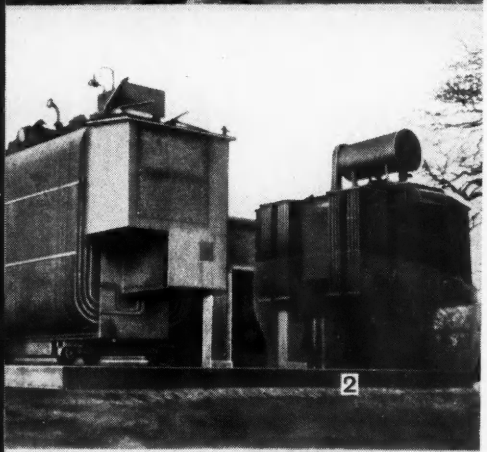
(5) Woolworth's and adjoining buildings form the first block to be completed in New George Street

paring the new plans in February, 1951, it was decided for economic and technical reasons to use the South Western Board's standard of 11 kV for h.v. distribution and to commence the feeding of this network from only two primary 33/11 kV substations in the north-west and south-east corners of the city centre.

The laying of two new 0·15 sq in 33 kV armoured cables from Prince Rock generating station to the first of these substations (No. 1) in Buckwell Street in the south-east of the area is almost completed and the substation itself is due to be put into service this month. To minimize the risk of interruption to supply owing to damage to the cables another pair of 0·15 sq in 33 kV cables from Prince Rock is to be taken by a completely different route to the second substation (No. 2) in the rear of Princess Street which is due for completion in 1954 or as the stage of development requires. Each of these substations is to be equipped with two 5 MVA transformers which with the feeders will be operated as feeder transformers to avoid the cost of 33 kV switchgear. "Solkor" protection is to be provided for each feeder transformer unit. Four Reyrolle CST 11 kV 400 A 250 MVA oil circuit breakers with spring closing mechanism will control the feeder cables and the transformers, with an

The route of the proposed h.v. network is shown red in this plan for the central area reconstruction scheme. An indication of the original street plan is printed in green





800 A unit for the bus section. L.v. supplies will be provided by a network joining up 500 kVA transformer substations through Reyrolle switchgear.

New Metrovick SB.18 33 kV 750 MVA feeder switches are to be installed at the Prince Rock switchhouse to control the first pair of cables to the substations but by the time the second pair is laid two Metrovick circuit breakers which at present control two grid transformers will be redundant as a result of alterations proposed and these will be suitably modified for feeder control.

From the two 33/11 kV substations two ring mains with an interconnector will form an 11 kV network, with a firm capacity of 20 MW, from which the new 11,000/415/240 V distribution substations will be supplied. This network will be built up gradually as the distribution substations are required with temporary connections maintaining a ring system. It will form the nucleus from which the system will be expanded to take over parts of the existing 6·6 kV system in adjacent areas when relief is required. " Solkor " protection is again to be adopted on all 11 kV cable routes.

In view of the necessarily piecemeal carrying out of the scheme, not the least of the problems to be overcome is the maintenance of the supplies through the 6·6 kV system while changing over to the 11 kV system and as a temporary expedient the new distribution substations are being operated initially from the 6·6 kV system. A further complication has arisen in view of a decision to take advantage of the opportunity to change over the low voltage from 346/200 V to 415/240 V.

The only new substation so far in operation is that in Dingles' building. This will ultimately be equipped with three 500 kVA transformers (or 750 kVA if necessary) but the temporary equipment comprises two 550 kVA 6,600/415/240 V

(1) To serve the Norwich Union building a temporary ring-main unit and transformer have been erected in the open on a concrete raft which will eventually form the floor of a permanent substation building

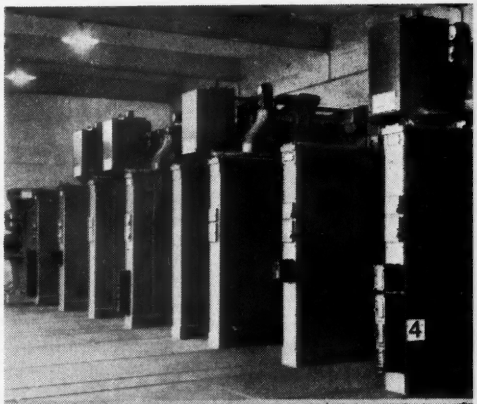
(2) The 5 MVA 33/11 kV B.T.H. transformer on the left will replace the 7.5 MVA 33/6.6 kV unit on the right when the distribution system at Stentaway is changed over from 6.6 kV to 11 kV

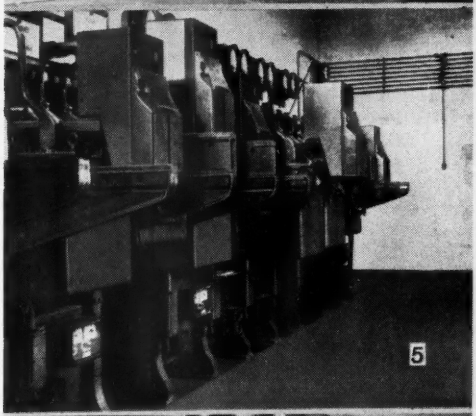
(3) Laying one of the pairs of 0.15 sq in armoured cables from Prince Rock generating station to the Buckwell Street substation, the first of the two 33/11 kV primary substations being erected to serve the reconstructed central area of the city

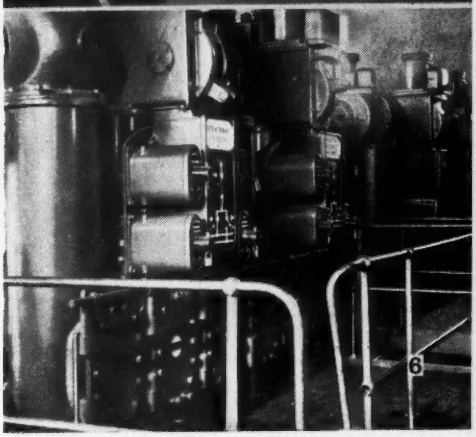
(4) **Reyrolle AR1T 33 kV 500 MVA switchgear at Merrivale substation**

(5) **This Reyrolle 11 kV or 6.6 kV 250 MVA switchgear at Elim Terrace is of the same type as that to be used in the new substations in the reconstructed area except that the latter will have spring closing gear**

(6) **A portion of the Prince Rock switchhouse where the reconstruction work will involve the provision of new 33 kV 750 MVA feeder switches similar to those shown**







Gresham transformers with Ferguson Pailin h.v. switchgear and a Lucy l.v. busbar system with h.r.c. fuses. A second substation is nearing completion in the Pearl building and a third has been started for the C.W.S. building. To serve the Norwich Union building a temporary ring main unit (Statter) with a Hackbridge 500 kVA 11,000/6,600/415/240 V transformer has been erected in the open on a concrete raft which will eventually form the floor of a permanent substation building.

Interconnection between the substations is provided on both the h.v. and l.v. sides and so that maximum possible capacity shall be available even in the event of a fault on one transformer it has been decided to standardize largely on transformers of 500 kVA. Thus in a typical substation of 1,500 kVA capacity the maximum alternative capacity required from the l.v. system would be 500 kVA. In view of the reliability of modern transformers, control by circuit breakers and balanced protection are considered unnecessary, it being confidently anticipated that switchfuse units on the 11 kV side with isolator links on the l.v. side should be adequate.

The general scheme provides for the feeders to be laid to the centre of the various blocks so that the services from the substations situated centrally in what in many cases will be car parks are being taken into the backs of the various buildings, thus reducing very considerably the length of the distributors.

Spectacular though the scheme for the reconstruction of the city centre is it forms only a portion of the electrical development work which has been proceeding in the Plymouth district since the war. Devonport, as well as the central area of the city, was very badly damaged and needs special and increased electrical facilities to meet the new and changed requirements. To rehouse those who lost their homes in the bombing and also to provide for the increasing population six large new housing estates are also being developed on the outskirts of the city at Ham, Ernesettle,

Whitleigh, Honicknowle, Efford and St. Budeaux and already 7,000 new houses have been erected. This has involved the provision of completely new distribution systems with a series of 500 kVA transformer substations with ring main units.

Industry too has made new demands on the electrical system. The establishment of a new factory by Tecalemit, Ltd., has for instance called for an additional 1,400 kW of available supply capacity in the Marsh Mills area, while Bush Radio are now taking about 140 kW at Ernesettle. Other new installations connected include the Berkertex clothing factory (160 kW m.d.), Saltram quarry (200 kW) and the City Engineer's depot (110 kW). The expansion of many existing factories is also adding substantially to the load.

The electrical development of the rural area is also advancing apace especially in the eastern side of the city in the Ivybridge, Wembury, Yealmpton and Holbeton areas where the increasing load is necessitating the change-over of the h.v. system from 6·6 kV to 11 kV later this year. Consumers are assisted by a line rental scheme.

Before the war the supply scheme comprised only 33/6·6 kV substations at Prince Rock, Milehouse and Newport Street. Since the war three new 33/6·6 kV substations, all linked up by the new 33 kV mains, have been built at Merrivale, Elim Terrace and Stentaway and a fourth is nearing completion at Alexandra Road. They are all designed for ultimate conversion from 6·6 kV to 11 kV distribution in accordance with the general policy of adopting 11 kV secondary h.v. distribution. In general the equipment comprises two 7·5 MVA transformers with Metrovick or Reyrolle 33 kV and 6·6 kV switchgear. Another recent development has been the laying of a 33 kV cable from Merrivale substation across the River Tamar to supply Cornwall. The supply to Plympton is due to be changed over to 11 kV next year.

Metrovick 11 kV switchgear at Merrivale substation

Apart from providing for new and increased electricity supplies for domestic, industrial and commercial purposes, the Board has also been responsible for the design and installation of several new street lighting schemes in the city and has several more in hand. The general policy is to have fluorescent lighting in the main shopping centre and high pressure mercury vapour lighting in the main roads. Just before Christmas 1½ miles of mercury vapour lamps were put into operation in Crownhill Road, all the fittings being mounted from a central elevation. Fluorescent lighting is to be provided in the Mutley Plain shopping centre as soon as the necessary materials are available and another 1½ miles of m.v. lighting is in hand for Old Laira Road and Alexandra Road. The City Council has also received sanction to proceed with a further 1¼ miles of m.v. lighting in Wolseley Road. Special designs of fittings are under consideration for Royal Parade, Armada Way and other main thoroughfares in the reconstructed areas. Besides being decorative they will have to illuminate roads 100ft wide.

In the carrying out of the various schemes the Board's task is considerably simplified by the existence of a co-ordinating committee comprising representatives of all interests concerned—architects, surveyors, electricity, gas and water undertakings, etc. The committee meets regularly once a month and such matters as the opening up of footpaths, etc., are discussed.

We thank Mr. N. Axford, manager, Plymouth District, South Western Electricity Board, and his assistants for their help in the preparation of this article.

VIEWS on the NEWS

By REFLECTOR

IT is notorious that people who "hesitate to advocate" anything do so just the same. A speaker at a recent textile works managers' conference hesitated to advocate any restriction of the use of electricity for any purpose but, he said, industry could not continue to be handicapped by the prior claims of domestic heating and hot-water supply. Therefore encouragement should be given to gas, with an adequate supply of coke or coal for domestic use. In other words let us burn more good coal, which might advantageously be exported, instead of using up the slack and low-grade fuel which can be dealt with only in power stations.

* * *

One can appreciate the feelings of the people of Margam. With one of the world's most modern steelworks, employing electricity on a very large scale, in their district they are still unable to secure the benefits of electricity in their homes. They are petitioning their local authority, the Port Talbot Council, to tackle the South Wales Electricity Board on the subject. Margam presents a good example of what has been happening all over the country in recent years. People at work see how efficiently and effectively their factories are run electrically and in spite of counter-propaganda they are imbued with the electrical idea and want to adopt electrical methods in their own establishments.

* * *

I have previously mentioned the difficulties which the electricity authorities are likely to have in collecting quarterly accounts if they abolish prepayment meters—as some of them are inclined to do. One Board has experimented with monthly, or more frequent, collections and now the North Western Electricity Board is reported to be trying another method. Half-crown stamps will be obtainable by consumers from the Board's showrooms and these will be used towards the payment of the quarterly bills. At first the scheme is to be tried out on a limited scale. Many consumers will appreciate the arrangement I am sure and it will no doubt be extended.

* * *

Mr. Bumble's dictum that "if the law supposes that then the law's a ass" seems to apply to an aspect of copyright law now bothering Electricity Consultative Councils. It appears that a letter of complaint from a consumer presented at a meeting of the North Western Council was published in a newspaper report of the Council meeting. The result was a threat of proceedings for infringement of copyright. The secretary of the Council agrees that in certain circumstances such an action could be brought but says it is clear that if such legal principles were taken far the work of Consultative Councils would be much hampered and the public would think that there was a great deal of unnecessary and undesirable secrecy.

* * *

A laudable effort is being made by the Society for the Protection of Ancient Buildings to help the country to overcome the power shortage. The Society believes that the old water mills in the country might be used to generate electricity and has asked the Ministry of Fuel and Power to have the subject investigated by experts. The Ministry has replied, according to a report which I have seen, that it will welcome information regarding mills that might be suitable for adaptation. But the B.E.A. had better keep on going ahead with its steam stations I think.

* * *

At a meeting of the Paignton Trades Council recently a member criticized the Urban Council for its refusal to provide electric lighting in certain roads. He said that "the price of 400 yards of cable cannot be very much." I wonder if he has ever tried to buy any cable.

Standard Motors

New English Electric Range

A RANGE of totally-enclosed fan-cooled, squirrel cage induction motors from 1 to 20 h.p. at four-pole speeds is now being made in accordance with draft British Standard CN(ELE)6814 by the English Electric Co., Ltd. Except for the 1 h.p., four-pole motor, the machines have dimensions similar to those laid down in the American N.E.M.A. Standard MG1–1949, but for a given frame size the outputs have been increased to line up with accepted practice in this country; the shaft dimensions of the motors have been adjusted accordingly.

Using only one type of enclosure, these motors are designed to supersede all other types of squirrel cage machines within their range. Their enclosure makes it possible, in the majority of cases, for them to be used instead of protected, screen protected, drip proof, louvre ventilated, single and double pipe ventilated, splashproof and straight totally enclosed motors.

The company believes that this draft specification represents only the first stage of standardization in this country, and that ultimately the range will be extended up to 50 h.p., and will include other mechanical variants such as flange mounting and possibly other enclosures.

In July, 1949, a valuable and comprehensive report was prepared by a Technical Committee of the Machine Tool Trades Association. After investigation in America this committee recommended that a British Standard should be drawn up based on the American N.E.M.A. frame sizes but with modified outputs.

In September, 1949, the report of the Committee for Standardization of Engineering Products (the "Lemon Committee") was published and as a result the British Standards Institution formed a committee from members of the British Electrical and Allied Manufacturers' Association, users and Government Departments to prepare a draft specification of standard dimensions necessary to ensure that motors of different makes would be mechanically interchangeable for all normal applications to the driven machine.

Relevant specifications from all over the world were carefully studied in order that the new standard should be universal. Finally it was decided to adopt the dimensions laid down in the American N.E.M.A. Standard MG1–1949 but increase the h.p. output per frame size in accordance with British practice.

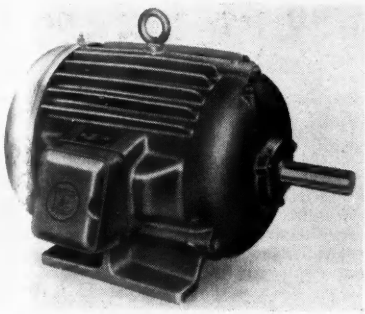
This resulted in the draft British Standard Specification CN(ELE)6814. This gives preferred outputs, speeds and dimensions for totally-enclosed fan-cooled, squirrel cage motors suitable for operation on three-phase, 50 c/s supplies of up to 650 V and complying with the relevant requirements of B.S. 168.

The motors in the English Electric "LY" range are constructed to withstand the most arduous duty. The stators are of one-piece cast iron construction with integral feet and terminal box base. All working surfaces are accurately machined in order to ensure correct alignment of fitted parts.

Stator cores, of high grade alloy stampings welded together and machined to fine limits on both external and internal diameters, are wound with synthetic resin covered copper wire. Slot insulation consists of heavy pressboard with mica and/or black

Details of Standard Range of Motors

Frame Size	Two-pole		Four-pole		Six-pole		Eight-pole	
	H.P.	Speed	H.P.	Speed	H.P.	Speed	H.P.	Speed
B.183 ..	1½	2860	1	1425	¾	930	—	—
B.203 ..	2	2845	1½	1415	1	945	½	715
B.204 ..	3	2870	2	1430	1½	945	¾	715
B.204 ..	5	2870	3	1430	2	950	1	715
B.225 ..	7½	2885	5	1445	3	960	2	720
B.254 ..	10	2885	7½	1450	5	960	3	720
B.284 ..	15	2900	10	1455	7½	965	5	720
B.324 ..	20	2910	15	1465	10	975	7½	730
B.326 ..	25	2920	20	1470	15	975	10	730



English Electric "LY" motor (7·5 h.p. 1,450 r.p.m.)

varnished cambric backing. The wound assembly is impregnated in an automatic continuous oven to form a tropically insulated unit which is then pressed and keyed into the stator frame.

The rotor is pressure die cast to form a practically indestructible unit. The rotor core is built up of similar alloy stampings as those used for the stator core and has aluminium alloy bars and end-rings with integrally cast fan blades.

The end shields are cast iron, well proportioned and accurately machined to give protection to the working parts and maintain correct alignment under the heaviest loads.

Four per cent carbon steel having an ultimate tensile strength of 38/42 tons/sq in is used for the shaft which is fitted with metric bearings as recommended in B.S. 292 : 1939.

The diagonally split terminal box gives easy access to the terminals. Stock motors are dispatched with the box on the right-hand side of the motor when looking at the non-driving end with the cable entry pointing vertically downwards. The terminal box may be turned to give three further positions for the cable entry each spaced 90 deg apart. Furthermore, the stator can be reversed when the terminal box is required on the left-hand side of the machine.

"Monopolies" Investigation

Electrical Plant Referred to Commission

THE Board of Trade has asked the Monopolies and Restrictive Practices Commission to investigate the supply and exports of certain electric generators, electric motors and transformers, and steam and hydraulic turbines for driving heavy alternators.

The detailed list of items affected is as follows:—

(*a*) Alternators of not less than 300 kW m.c.r. designed to be driven by turbines; steam turbines (including condensing and feed water heating equipment therefor) and hydraulic turbines for driving such alternators.
(*b*) Other alternators of not less than 10 kVA rated output.
(*c*) D.c. generators of not less than 0·75 kW per 1,000 r.p.m. and of not less than 0·75 kW actual rating.
(*d*) A.c. motors of not less than 1 h.p. at any speed.
(*e*) D.c. motors of output equal to not less than 1 h.p. per 1,000 r.p.m. and of not less than 1 h.p. actual rating.
(*f*) Transformers of not less than 5 kVA rated output.

According to the terms of reference, the Commission is required to make a report to the Board of Trade both about the facts of the matter and about the bearing of the facts on the public interest. Any person or organization wishing to offer evidence on the subject should write to the Secretary of the Commission, 3, Cornwall Terrace, London, N.W.1.

Highland Transmission Line

LAST week the North of Scotland Hydro-Electric Board published details of a proposed addition to the 132 kV Highland grid which will be erected over the 2,507ft Corrieyairick Pass in Inverness-shire. The new line will extend 25 miles from Port Augustus to Glentruim, near Newtonmore, where it will join an existing 132 kV line from the Tummel Valley to Keith, Banff. At Port Augustus it will connect with lines from the Affric, Garry and Moriston hydro-electric stations. After consultation with landowners and associations concerned with rural amenities, the Board agreed to adjust the route of the line from a point west of Garva Bridge for a distance of about seven miles in order to preserve the view and to avoid, where possible, crossing the road.

Large Frequency Changer

Combination of Seven Machines

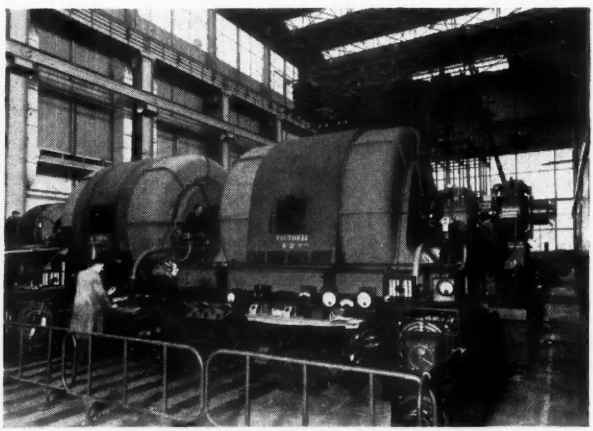
ONE of the largest frequency changers made in England recently left the English Electric Co.'s Stafford Works for the Newport power station, near Melbourne, Victoria, Australia. The set will be used for transferring electric power between a system operating at a frequency of 25 c/s and another of 50 c/s.

This frequency changer consists of seven machines: a 37,500 kVA 0·8 p.f. 50 c/s salient-pole machine; a 30,000 kVA unity p.f. 25 c/s salient-pole machine; a slipring induction motor for starting, two main exciters and two pilot exciters. The 37,500 kVA machine will be connected directly to the 22 kV 50 c/s system and the 30,000 kVA machine to the 20 kV 25 c/s system.

To facilitate synchronizing, the stator of the 50 c/s machine is capable of being rocked through an angle of 45 mechanical degrees, and the polarity of the field systems of both machines is reversible. The speed of the set is 750 r.p.m., its overall length 63ft and the total weight 420 tons.

Because of the large size of the two main machines, approved routes had to be planned in advance for the road journey to Liverpool Docks. These stators weigh about 80 tons each and the height of the larger is 15ft.

As the lifting facilities at the Australian port are unsuitable for the heaviest weights involved in this case, it was necessary to employ a ship having a derrick strong enough for this purpose so the *Clan Macdougal* of the Clan Line, normally in the South African service, was accordingly chosen.



Frequency changer for Victoria, Australia, on the test bed at the makers' works in Stafford

British Association

Programme for Belfast Meeting

THE preliminary programme for this year's meeting at Belfast of the British Association for the Advancement of Science (3rd–10th September), together with registration and travel reservation forms, is now available from the secretary, at Burlington House, Piccadilly, London, W.1. The full programme giving detailed arrangements will be published during the week ending 9th August and will be sent to all who intimate their intention of attending the meeting.

The inaugural general meeting will take place in the Whitla Hall, Queens University, on the evening of Wednesday, 3rd September, when the president, Prof. A. V. Hill, C.H., O.B.E., F.R.S., will deliver his address on "The Ethical Dilemma of Science." This meeting will be preceded in the same hall by a special Graduation at which honorary degrees of the Queens University will be conferred.

Three evening discourses will be delivered. On 5th September Mr. A. C. Hartley will speak on an engineering subject, on 7th September Prof. A. Macbeath will deal with a philosophical subject and on 8th September Sir William Slater will discuss science in agriculture. There will also be five afternoon lectures for young people.

The president of Section G—Engineering—will be Sir Ben Lockspeiser, K.C.B., F.R.S., who in his address will speak on progress in aeronautical science and engineering. The president of Section A—Mathematics and Physics—will be Prof. A. M. Tyndall, C.B.E., F.R.S., and his address will be entitled "Recent Contributions to Experimental Physics from Britain."

A large number of excursions, tours and visits to works and various places of interest in the Belfast region have been arranged, together with the usual complement of social functions.

Power Station Commissioning

Basic Requirements and their Application

In a lecture to the London Technical Group of the Electrical Power Engineers' Association on the commissioning of a power station, Mr. C. W. Priest discussed the basic requirements and Mr. L. E. Brickwell their application to a particular station. Both speakers emphasized that the views they expressed represented no more than personal opinions based upon their own experience.

The commissioning process started, Mr. Priest said, even before the first specification was ready, since the design staff must then decide on how a new station was to get going. On site a small supply from an outside source would first be needed for lighting and heating contractors' offices and for power for tools. Then, before steam could be produced, motors, possibly up to 700 h.p., for the auxiliary plant, with their switchgear, must be cabled and tested. The energizing of the requisite transformer would give a key date. This electrical system would have to be built up without taking commissioned plant out of service.

Large quantities of water were required (at Poole the total had been 342,000 gal) for the initial boil out, preparatory to floating the safety valves, and for hydraulic testing and flushing of pipes. For providing treated water thermo-compressor evaporators could be fitted with temporary nozzles to allow of operation at reduced steam pressure and a temporary donkey boiler with valves and piping for evaporating raw water could be installed.

Construction Programme

The next phase was to order each plant item in time to perform its part in the operational sequence, avoiding both the cluttering up of the site by too early arrival of larger equipment or dislocation of the arrangements by its coming late. It was essential to prepare a programme in great detail and to overlay this with a construction record as the work progressed. Ten or twelve months before the tentative commissioning date attention could be concentrated more on completion detail; this would require new simplified charts. The programme-progress charts should, however, be continued as they would still show up bottlenecks. The new detail charts would show, for instance, each pipe, joint and weld in boiler tubing and when installed, indicating at once omissions and shortages and the possibility of making ready a portion of a job if the whole could not be completed in time.

Between one and three months before the realistic commissioning date, an outline of the programme should be put down on paper and spread into the commissioning process for individual items to ensure that these were checked and ready for operation. One man should be made responsible in each case.

Staff Meetings

Once steam was raised, morning and evening meetings of all concerned would probably be necessary to agree upon alterations and to record progress. The most important single task was the creation of a team comprising consultants', manufacturers' and owners' staffs under one leader who would be given enough authority to iron out difficulties on the spot. For a major power station there might be 40 main contractors and two or three times that number of sub-contractors, each concerned primarily with their own plant and liable to ignore the tie-up with others.

The station superintendent should come to the station, followed by the chief clerk, at least four or five months before commissioning date and other members of the operating staff (including manual workers) should have opportunities to obtain a detailed knowledge beforehand of the plant layout, particularly as most of them would be new to each other and to the district. Adequate workshops equipped with machine tools and welfare facilities should be established early. As soon as any electrical equipment was made alive, staff should be available to issue permit-to-work cards.

In his section of the lecture, Mr. Brickwell first described the leading technical features of Poole power station, particulars of

which were given by Mr. R. H. Coates in the *Electrical Review* of 28th September last. One of Mr. Brickwell's first tasks as station superintendent was to arrange for the appointment of a technical staff, the majority of whom came to the station two to four months later, but experience showed that six months would have been more satisfactory.

Local labour had had little experience of the requisite kind and lack of housing accommodation prevented the attraction of trained men from other areas. The first employees were sent for one or two months for training at other stations. For the boil out pulverized fuel was used, since with reliance on the oil burners, intended for ignition only, the oil might be deposited on heating surfaces and in the precipitators, introducing risks of possibly disastrous fires. Special high volatile coal had to be ordered as the normal fuel was South Wales coal of only 10 to 20 per cent volatile content.

During initial steam raising thermocouples were fixed on various elements across the boiler width and connected to quick-action electronic recorders. Firing rate could thus be controlled to keep metal temperatures below 1,000 deg F. For make-up water entire reliance had been placed on a Deminrolit de-ionization plant, which provided 300,000 gal per week for the present installed capacity of 150 MW. In the meantime the circulating water system was commissioned and turbine auxiliaries and the lubricating system were tested. Steam strainers in the valve chest inlets had proved their value in preventing damage to turbine blading from debris. Stator windings were dried out by a ventilating fan in closed circuit without coolers to maintain a temperature of 130 to 140 deg F continuously.

Operational Procedure

For a modern high-pressure two-shift station an operational procedure must be laid down and the reasons for it must be understood by those concerned. Only by carrying out tests under varying conditions could the safe running up times of a turbine be ascertained. Starting conditions likely were: first, from live steam receivers at normal temperature and pressure after turbine shut-downs for 6 to 8 hours, 24 hours and 36 hours and from cold; secondly, from boilers being commissioned (reduced temperature) after a turbine shut-down for 6 to 8 hours, i.e., the first boiler and turbine to be commissioned for two shift working. In the future both boiler pressure raising tests and turbine running up tests might take place together.

Instrument installation could not proceed until the erection of the main units was almost complete as instrument runs might be damaged or in the way of erection work. Lack of controls for a large p.f. boiler would, however, introduce hazards in preliminary operation. Minimum requirements were suggested but these varied with the type and layout of the plant; in all cases a water meter should be included.

Refrigerator Exports

SERIOUS consequences to the British refrigeration industry are likely to follow the recent decisions of several countries to substantially curtail imports during the current year and also the action of a number of other countries who are now holding up shipments as a consequence of our own Government's decision to limit its purchases of food, etc., from those sources.

The British Refrigeration Association points out that the industry achieved two records in 1951: its total production was nearly £29,000,000 (an increase of 25 per cent over 1950) and its exports totalled £13,500,000 (35 per cent more than in 1950). It says that unless the Government is prepared to take immediate action then all the good work which the industry has done in building up export business and displacing American manufacturers in many of the world's largest markets will be irretrievably lost.

Exports in 1951 included the following:—Australia, £2,136,674; South Africa, £1,565,388; New Zealand, £762,535; and France, £739,699.

Under the recent decisions the Australian imports for 1952 are to be limited to 20 per cent of their 1951 value and in South Africa, to 40 per cent of their 1948 importations. In the case of these two countries alone, this represents a probable loss of £1¾ million worth of business.

Already, the Association says, manufacturers find themselves saddled with accumulated stocks and have had to discharge considerable numbers of people and further unemployment will no doubt soon follow. There is little hope of finding new markets to replace those which are now being lost.

The Association believes that the only solution of the problem is for the Government to permit at once the sale in the home market of such domestic refrigerators as cannot now be disposed of overseas.

Portable Tool Protection

Earth-Proving Supply Point

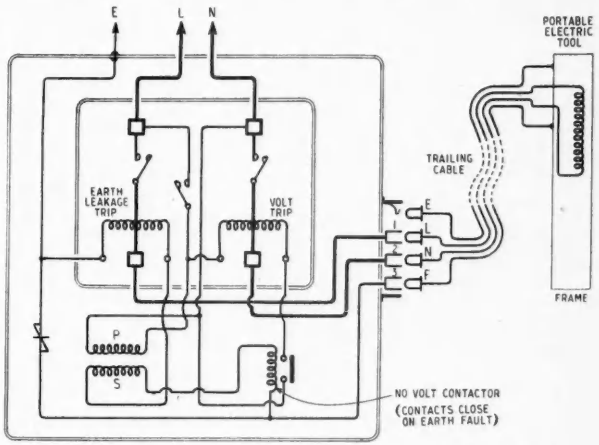
By S. W. ECKETT, A.M.I.E.E.

THE apparatus described below is intended for use as a switched socket outlet for supplying portable electric tools. Its purpose is to ensure the immediate isolation of any tool fed from it should the earthing of the tool casing become defective. As the apparatus operates on the circulating current principle the flexible cable to the tool must have two earth conductors with separate connections to the tool casing.

The complete apparatus includes a small circuit breaker, an auxiliary contactor, a low voltage transformer, and a silicon carbide disc, all fitted in a metal case on which is mounted the outlet socket. The circuit breaker has a mains operated trip coil, a 1 A current operated trip coil and an auxiliary contact which closes before the main contacts.

Referring to the diagram of connections, the first action of switching on is to close the auxiliary contact which energizes the transformer primary and also, through contacts on the auxiliary contactor, the voltage operated trip coil. Under healthy conditions, the transformer secondary will circulate (through the earth conductors and tool casing) a current which will open the auxiliary contactor and prevent operation of the voltage trip. Finally the main contacts will close and connect the tool to the supply. If the earthing circuit is not complete, or has a resistance above about 7 Ω, the breaker will not connect the tool to the mains.

If while the tool is in use it develops a fault to earth, and the earth conductor "E" is broken, the earth leakage current might hold in the auxiliary contactor, but this current also passes through the current operated trip coil and as soon as the voltage on the tool casing reaches 10 V the breaker will trip. If the earth fault current under these conditions were large, it would, in the absence of any alternative path, develop a large voltage across the 10 Ω impedance of the combined operating coils and transformer secondary which are connected in series with the earth conductor labelled "F." If the tool user were touching earthed metal, such a voltage rise on the tool casing might be dangerous. This impedance, however, is shunted by a silicon carbide disc, which effectively provides a short circuit and suppresses the voltage surge which would otherwise occur. It should be noted that the silicon carbide disc does not interfere with the normal operation of the apparatus, since its resistance



Circuit diagram of earth-proving supply point for portable electric tools

then is well over 20 Ω. Its presence, however, does afford protection against shock, which, while not fatal in itself, might cause an accident of some other kind.

Since the action of the apparatus is to prove electrical continuity between the tool casing and terminal " E " it will be apparent that proper earthing of terminal " E " is essential. Although this portion of the circuit is part of the permanent installation and therefore less vulnerable than the flexible cable to a portable tool, regular tests on the earth continuity of the system must be made to ensure that dangerous conditions do not arise. Where multiple earthing is permissible, however, a simple modification to the connections enables the earth/neutral loop to be monitored together with the earth connection to the tool. In this case the wire from the left hand, or current operated trip coil, is transferred from terminal " E " to terminal " N " and a second auxiliary contact can be provided to open this connection with the breaker off. Another, and better, solution is possible in those cases where an entirely independent earth electrode can be installed. The wire from the current operated trip coil can then be taken to the auxiliary earth electrode instead of being connected either to terminal " E " or to terminal " N." With this connection, the monitored circuit includes the earth connection to the tool, the main and auxiliary earth electrodes, and the continuity between them of the mass of earth itself.

The apparatus tests the earthing circuit before energizing the tool and, in the standard form, ensures that excessive voltage cannot appear between the tool casing and terminal " E " at the supply point. Furthermore, the tool user can readily check the correct operation of the device at any time, by attempting to switch on before plugging in the portable tool, or by removing the plug with the switch on.

Acknowledgment is due to Nalder Bros. & Thompson, Ltd., for permission to publish this article.

"MODERN ELECTRICAL CONTRACTING"

THE series of articles dealing with the business side of electrical contracting by H. R. Taunton, A.M.I.E.E., which appeared in the *Electrical Review* in 1950 and 1951 were well received. Many contractor readers testified to their practical value and asked if they could be made available in book form.

In view of the demand we decided to reproduce the articles in a handy volume and this is now available. Mr. Taunton commences at the beginning, giving sound advice to those who contemplate embarking upon electrical installation work on their own account. He warns aspirants against excessive optimism and sets out the minimum requirements to be met before a contracting business is launched.

He discusses the ways in which work is obtained and how to deal with it when it is secured. Item by item he describes from his long experience in the industry the kind of system which must be built up and maintained to ensure the kind of service which alone can keep the business going and bring a satisfactory financial return.

Mr. Taunton's style is very readable and pre-eminently " down to earth," making the book interesting as well as instructive.

The book, " Modern Electrical Contracting: Business Organization and Routine " (176 pages), is published for the *Electrical Review* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, at 10s 6d (postage 5d).

Locomotives for South Africa

THE English Electric Co. has received an order from the South African Railways and Harbours Administration for sixty electric locomotives to operate on the 300 V d.c. electrified lines of the Union. The order is worth approximately £2,500,000. Each of the locomotives will weigh 77 tons and will have a maximum axle load of 19·5 tons. The locomotives will be of the class 5E double bogie type, wheel arrangement (Bo-Bo), with one-piece cast steel bogie frames. The four traction motors will develop a total of 2,000 h.p. at the one hour rating and the control provides for series and parallel grouping with full field and weak field running positions and regenerative braking.

Dangerous Machines

Liability to Employees During Manufacture

By C. F. MAYSON, A.M.I.E.E.

A VERY recent decision of the House of Lords, affecting the liability of a manufacturer under the general safety provisions of the Factories Act, 1937, Part II, is of some importance as it settles a question which has not previously been considered by the Courts. Shortly, it is to the effect that a machine made in a factory and intended for sale, does not come within the provisions of Part II of the Act so long as it remains in the factory. It is of value to consider it in some detail, as a decision of the House of Lords, the highest judicial tribunal, is binding on all Courts in England and Wales and, in this case, in Scotland, and can only be changed by legislation.

Claim for Damages

An employee of a firm of bakery machinery manufacturers claimed damages for injury received while cleaning a dough-brake in readiness for despatch. He had been instructed to clean the rollers of oil and grease while they were in motion, and for that purpose the guard was removed. He was so engaged when his hand and arm were drawn between the rollers. At the time of the accident the employee, an apprentice fitter, was 17½ years of age. His claim was based on breach of statutory duty as laid down by Sections 16 and 20 of the Act. Section 16 is to the effect that fencing or guarding must be kept in position when the machine is in use

> "except when such parts are necessarily exposed for examination and for any lubrication or adjustment shown by such examination to be immediately necessary. . . ."

Section 20 prohibits the employment of women and young persons (those under the age of 18) to clean

> "any part of a prime mover or of any transmission machinery while . . . in motion," or "any part of any machine if the cleaning thereof would expose the woman or young person to risk of injury from any moving part either of that machine or of any adjacent machine."

The actual provisions for fencing or guarding are contained in Sections 12, 13 and 14 (1). Section 12 deals with prime movers, Section 13 with transmission machinery, and Section 14 (1) with machinery other than that covered by the two previous sections. Sections 16 and 20 can apply only if Sections 12, 13 and 14 (1) apply.

Production Machinery

The question to be decided was whether the wording of the relevant Sections, and in particular that of Section 14 (1), confined their scope to machinery used only in manufacturing processes. Section 12 (1) concludes with the words "whether the flywheel or prime mover is situated in an engine-house or not," and it was considered by the House that these words can apply only to machinery which is part of the factory equipment. By similar reasoning it held that the rest of Section 12, together with Section 13, is concerned only with such equipment. Applying the recognized principles of interpretation, it follows that Section 14 (1) must be construed as applying only to machinery used for a similar purpose, that is for production. The answer to the question being, therefore, in the affirmative, Sections 16 and 20 could not apply and there was no breach of duty by the occupiers.

Common Law Duty

So much for the statute law. But it must be remembered that, irrespective of this decision, the common law rules still apply, and it is the employer's duty to provide a safe system of work.* It is a question of fact whether, in the circumstances of the case, there is negligence in not providing and maintaining a safe system. In this case the House did not have to consider the question, and the reports of the earlier proceedings do not state whether the

* As to this duty, see "Safe Systems of Work," C. F. Mayson, *Electrical Review*, 28th March.

apprentice was successful in his alternative claim in negligence at common law.

In conclusion, it may be appropriate to consider the dual basis of liability in cases of this kind, for not only can a fine be imposed for breach of the statutory duty, but damages, often out of all proportion to the fine, can be claimed both for the breach of that duty and for negligence in not fulfilling a common law duty based on the same facts. It is mainly a question of the onus of proof. The Court of Appeal has held that:

> "If there is a definite breach of a safety provision imposed on the occupier of a factory and a workman is injured in a way which could result from the breach, the onus of proof is on the employer to show that the breach was not the cause."

It is otherwise in the case of a common law breach of failure to provide a safe system for any claim on that ground must set out what the proper system of work should be and in what way it is alleged that the system has fallen short, the onus of proof being upon the person who alleges the breach.

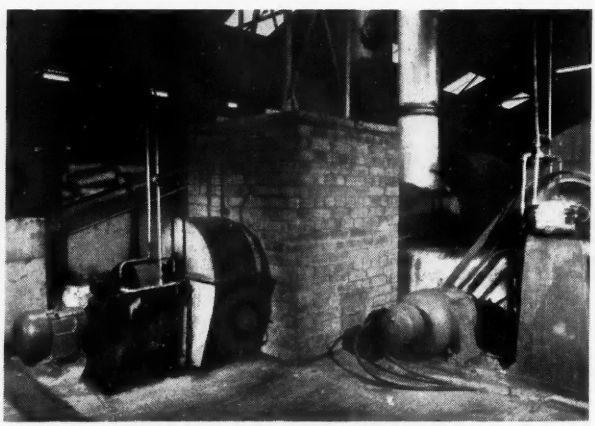
As it is, in general, more difficult to dislodge a *prima facie* case than prove a positive one, an employee has a better chance of succeeding in a claim based on breach of statutory duty than he has in one founded on the common law.

Food from Seaweed

THE seaweed family of marine algae is a large one. Round the more rocky coasts of Great Britain some five hundred different species may be found, which may reach up to 20ft in length. In the factory of Moray Firth Seaweed Products, Ltd., at Geddes, near Nairn, animal and poultry foods and fertilizers are being manufactured by a process which blends many kinds together in varying proportions for different animals. Working two shifts, the output of the factory varies between 20 and 25 tons of finished products weekly, requiring up to 20 tons of wet seaweed each day. Blasts of hot air are blown under the conveyors, which are continually moving; the drying process takes from sixteen to twenty minutes, depending on the type of seaweed going through the dryer whence it is carried by another conveyor into a hammer mill that grinds it into meal, which is blown through a cyclone and a hopper into bags.

Afterwards meals made from different types of seaweed are blended together and organic matter of vegetable and animal origin is added to increase the value of the finished products as stock food and fertilizers. Most of the products are sold in meal form, but a proportion of the output is sent out as cubes for cattle. At present, roughly half of the output goes to England, the rest being sold in Scotland; trial shipments have been sent to the Continent.

The actual process is simple, but has to be done quickly. Brook motors and automatic contactors are used throughout the installation on the fan dryers, conveyor belts and on the hammer mills. Main switches and control gear are in a central switchroom with remote control of the various machines. William Reid (Forres), Ltd., were responsible for the installation work. The company is considering the erection of processing factories elsewhere in the North of Scotland.



Motors (7½ and 18 h.p. driving high and low temperature fans on seaweed processing plant

Commerce and Industry

Increase in Copper Prices

Large Horizontal Shaft Generator

THE Minister of Supply has made an Order adjusting the price of copper and copper alloy secondary and scrap metals, following the announcement by the Ministry of Materials of a £4 per ton increase in the virgin copper selling price. The Order (the Copper, Zinc, etc., Prices Order, 1952, S.I. 1952 No. 729) increases the maximum controlled prices of secondary unwrought copper by £4 per ton, copper scrap, gilding metal, and gun metal by £3 per ton, and cupro-nickel and brass by £2 per ton. It also consolidates and revokes the earlier non-ferrous metals prices Orders. It came into effect on 8th April.

Manx Power Engineers' Salaries

Engineers employed in the electricity undertakings of the Isle of Man recently asked for the application to their salaries of the percentage increases granted to power station staffs in Great Britain last July. The matter was referred to an arbitrator (Sir Sidney Wadsworth) who has now awarded the applicants a 5 per cent increase on the first £450 of their salaries. (In the case of Great Britain it was 10 per cent with smaller proportional rises upon amounts above £450.)

West End Store Lighting

The lighting on the third floor of the West End House of D. H. Evans & Co., Ltd., has recently been entirely replanned. The new installation comprises 134 George Forest lighting units enclosing cold cathode fluorescent lamps. Of these 115 are 4-lamp fittings and the remainder 3-lamp fittings. The colour of the lamps is intermediate white. Each unit is just over 10ft in length, 27in wide and 10in deep. The metalwork is stove enamelled in an ivory finish. The glass panels are held within metal frames which are removable for cleaning, and control gear is enclosed within the metal end caps. Safety plugs are provided which disconnect supply to the h.v. transformers immediately the end caps are released. The wiring provides for two separate circuits, so that the lighting may be either full or half intensity. Two smaller fittings have been installed in the entrance to the showrooms on this floor, and in the fashion theatre a special feature of the same design, 44ft long, incorporates seven lamps, six of which are intermediate white and one gold. This fitting is controlled on three circuits. The fittings, which were designed and made by George Forest & Son, Ltd., to the requirement of the stores manager, Mr. A. Bullock, and the chief engineer, Mr. J. H. Cheaterman, were installed by Drake & Gorham, Ltd.

Fluorescent lighting at the Oxford Street store of D. H. Evans & Co., Ltd.

Hydro-Electric Plant for Norway

Additional hydro-electric plant is to be installed at Aura Kraftonlegg, Norway, in connection with a new aluminium plant now under construction at Sunndalsora. For this project the General Electric Co., Ltd., has been entrusted with the order for a 62·5 MVA, 12·3 kV, 428·6 r.p.m. horizontal shaft alternator for coupling to an Escher Wyss Pelton wheel. The alternator will be designed and built in the company's engineering works at Witton, Birmingham, and although machines of bigger output have been made, the physical dimensions of this machine will exceed anything previously constructed in the works; it will be one of the

largest horizontal shaft hydro-electric sets in Europe. The alternator will weigh over 310 tons, the rotor alone accounting for about 170 tons. Transport difficulties are such that no part must exceed 55 tons in weight and for this reason the machine will be specially designed and constructed so that it can be shipped in sections and erected on site.

Tender for Copper Wire Withdrawn

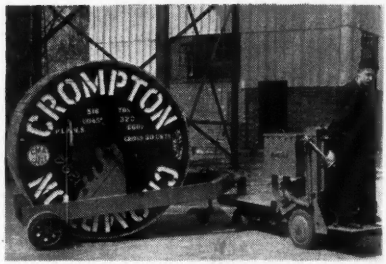
At a recent meeting of the Highways Committee of the Manchester Corporation it was decided to rescind a resolution of the Committee of 15th November last accepting the tender of the Edison Swan Electric Co., Ltd., for the supply of hard drawn copper wire for street lighting. The company intimated that, due to the deterioration in the supply of bare copper, it was unable to enter into a contract with the Corporation for the supply of this material. The Highways Committee reports that stocks of copper wire in the Department are sufficient to meet requirements for some considerable time.

Aluminium Welding and Riveting

Six months ago there was a symposium on this subject in London. The welding of light alloys, including the argon-arc process, was dealt with from both the research and practical aspects at the first session. The properties and driving of large aluminium rivets as well as the design characteristics of aluminium riveted joints were described at the second session. The introductory remarks, papers, discussions and the authors' replies have been bound in a single volume and published by the Aluminium Development Association, 33, Grosvenor Street, London, W.1.

Transporting Cable Drums

A carrier for handling cable drums at their Derby Works has been introduced by Crompton Parkinson, Ltd. An "Electricar" industrial truck tows a drum carrier designed and supplied by I.T.D., Ltd. The "Electricar" is a type TLR6 one-ton load capacity, elevating platform industrial truck, powered by a "Young" armoured traction battery. The I.T.D. carrier is designed to accommodate different sizes of drum.



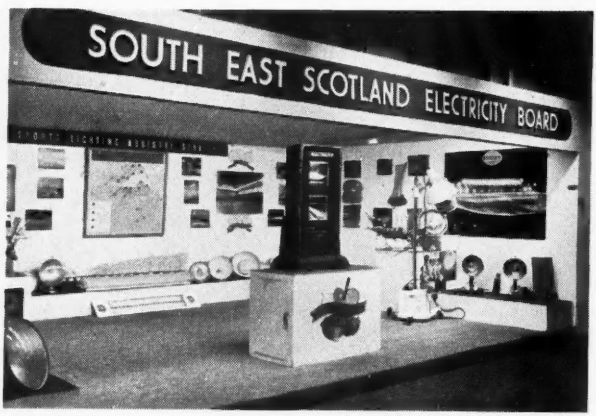
A drum carrier towed by an "Electricar" industrial truck at the Derby Cable Works of Crompton Parkinson

E.W.F. Helps E.I.B.A.

At the recent annual general meeting of the Electrical Wholesalers' Federation a sum of £125 was raised for the Electrical Industries Benevolent Association. A member of the Yorkshire Section offered to double this sum with the result that the E.I.B.A. benefited by £250.

Lighting for Recreation

Sports lighting advisory service was the theme of the display arranged by the South East Scotland Electricity Board at the Festival of Sport held recently in Edinburgh under the auspices of the Central Council for Physical Recreation. Many prominent lamp and fittings manufacturers, in addition to the Electric Lamp Manufacturers' Association and the Electrical Development Association, co-operated by lending photographs and equipment which assisted in creating an attractive display. The photographs illustrated actual applications of artificial illumination to a large variety of indoor and outdoor sports.



Display by the South East Scotland Electricity Board at the recent Edinburgh Festival of Sport

Burden of Taxation

In the course of his speech at the annual meeting last week of the Federation of British Industries, the president, Sir Archibald Forbes, said that one of the real difficulties in preserving the country's well-being was the problem of the financing of industry in the face of crushing taxation and it would become rapidly more acute unless that burden was reduced.

There could be no doubt that the imposition of an excess profits levy was a grave blow to industrial enterprise and competitive efficiency. A tax in this form could not fail to be productive of inequity and stifling to initiative. The concessions in the profits tax would, in the main, only represent a net benefit where operations were more or less static. The enterprising and developing undertaking—notably that which had responded to the call for greater exports—would be the most severely hit. The tax must either be withdrawn or at best radically modified to remove its worst features.

Three-Phase Motors

In the review of the book "Three-Phase Motors (Theory and Operation)", by T. F. Wall, in our issue of 4th April, the wrong address was given for the publishers, George Newnes, Ltd. It should have been Tower House, Southampton Street, London, W.C.2, and not 37, Essex Street, London, W.C.2, which is the address of Chapman & Hall, Ltd.

French Foreign Trade

Last year French exports of electrical machinery and materials increased in value by about 55 per cent compared with 1950. Imports rose by about a third but were well under half the value of exports. Generating plant figured largely among exports and the total value increased by 75 per cent, leading destinations being Algeria, Morocco, Poland and French West Africa. Imports of generators, motors and transformers totalled fr. 1,658 million less in value than exports and came chiefly from the United States, Italy, Switzerland, Germany and the United Kingdom, in that order.

Wires and cables were an active export line, expanding by 50 per cent in value between 1950 and 1951; overseas France was the outstanding customer, with Egypt and Belgium-Luxemburg also noteworthy. Imports of wires and cables were relatively unimportant. French exports of radio apparatus rose in value last year to nearly fr. 5,000 million while imports were not much over fr. 1,000 million. They were widely distributed; customer countries included not only French Africa but Argentina, Belgium-Luxemburg, Turkey and Brazil were also good buyers. (The French franc averaged 980 to the £ in 1950 and 1951).

Canadian Storage Battery Sales

Sales of electric storage batteries and parts by principal Canadian producers in the calendar year 1951 totalled $20,579,672, an increase of 20 per cent over the preceding year's figure of $17,120,365.

West German Exports

Exports of electrical goods and machinery from Western Germany more than doubled in value between 1950 and 1951. Last year their total was Dm. 658,980,000 compared with Dm. 308,114,000 in 1950. Imports of this class were valued at Dm. 58,053,000 in 1951 against Dm. 53,418,000 in 1950. While European countries were leading customers, with Sweden, Holland and Turkey noteworthy among them, there was ample evidence of successful efforts to regain the position formerly held in a wide range of markets. For example, generators, motors, etc., found outlets in South Africa, India, Egypt, Indonesia, Argentina, Brazil and other Latin American countries. Exports of radio goods continued to increase, 89 different countries being listed as markets.

Lighting at Guy's Hospital

In the new Orthopaedic Ward at Guy's Hospital, London, fluorescent lighting has been installed. The lighting units are "Atlas" GK/4240 incorporating four 2ft 40 W warm white lamps. The lighting is adequate for all

One of the wards of Guy's Hospital in which "Atlas" fluorescent lamps have been installed

purposes, providing soft diffusion of general lighting with freedom from glare which is so important in hospital surroundings. The equipment, manufactured by Thorn Electrical Industries, Ltd., wss installed by the hospital electrical staff.

Material Price Indices

The Board of Trade price index number for materials used in the electrical machinery industry (June, 1949=100) was 165·4 (provisional) in March compared with 160·2 in February and with the 1951 average of 151·9. The increase is attributed largely to the rise in iron and steel prices late in February.

Electrical Engineers' Exhibition

In our report of the Electrical Engineers' Exhibition (4th April, page 744) the name of the exhibitor showing telephone coin boxes, the G.K.N. microhardness tester and a hotel radio control unit should have been given as Hall Telephone Accessories, Ltd.

Trade Announcements

Jelson Electric, Ltd., has removed to Spring Road, Tyseley, Birmingham, 11.

A London sales office has been opened by **Radio Heaters, Ltd.,** at 46, Grays Inn Road, High Holborn, W.C.1 (telephone : Chancery 8354).

Mr. R. Bate, Loughborough sales director of the **Brush Electrical Engineering Co., Ltd.,** is transferring his headquarters to the Brush Aboe group's offices at Duke's Court, London, S.W.1.

Catalogues and Lists

Carter & Co. (Nelson), Ltd., Nelson, Lancs.—Revised catalogue of electrically operated sirens and sound signals.

Truvox Engineering Co., Ltd., Exhibition Grounds, Wembley.—Illustrated and priced leaflet concerning the "Juno" floor polisher.

Metway Electrical Industries, Ltd., King Street, Brighton, 1.—Illustrated priced list of dimmers, resistances, elements and heating mats (JYJ/30).

Alliance Wholesale, Ltd., 24-30, Gillingham Street, London, S.W.1.—Industrial and commercial lighting catalogue, containing over 200 pages including prices and index (495).

British General Manufacturing Co. (1941), Ltd., 38, Glasshill Street, London, S.E.1.—Illustrated display card on bells, lampholders, connectors, etc. ; and leaflet describing FS2 and FS4 glow type starter switches available for export market only.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—Specification folders featuring flameproof conduit fittings (FL 1834A) and "Prismax" watertight and circular type bulkhead fittings (L 1848A).

Londex, Ltd., Anerley Works, 207, Anerley Road, London, S.E.20.—Illustrated, priced, loose-leaf catalogue in the form of a binder with provision for additional new sheets.

W. & E. Kupfer, Ltd., 38, Glasshill Street, London, S.E.1.—Folder containing illustrated descriptions of the "Wafax" range of fluorescent lamps and fittings.

B. I. Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.—Illustrated technical booklet on mass-impregnated, non-draining cables (308).

Bill Switchgear, Ltd., Aston Lane, Perry Barr, Birmingham, 20.—Eleventh edition of the company's catalogue, containing over 100 pages on switches, switchfuses, distribution boards, etc.

Perihel, Ltd., 17-19, Edge Street, London, W.8.—8-page illustrated folder on the "Actina" portable sun-lamp, and a leaflet on the "Hyginare" air sterilization unit.

W. T. Henley's Telegraph Works, Co., Ltd., 51-53, Hatton Garden, London, E.C.1.—Illustrated priced catalogue of flexible cords, being the first to be issued since before the war.

Street Lighting

TENDERS are to be obtained by the WEST HARTLEPOOL Town Council for the provision of street lighting columns and lighting fittings in connection with proposed improvements in Cleveland Road, Clarence Road, Stockton Street, Stranton, Hart Lane and York Road.

The Ministry of Transport is being asked by DURSLEY Council (Glos.) to agree to the street lighting system being changed from gas to electricity.

COVENTRY Corporation has approved the proposed installation of 739 street lamps at various housing estates at an estimated cost of £22,612. The work will be undertaken by the street lighting section of the City Engineer's Department.

BRADFORD Corporation's Street Lighting Sub-Committee has recommended a £4,239 scheme for converting the present gas lighting in the central area to electric lighting.

NEWBIGGIN (Northumberland) U.D.C. is carrying out a £13,000 electric street lighting scheme. The first stage is in hand at Newbiggin Colliery and work will start later at the West End.

Lighting along the whole of the Birmingham–Wolverhampton new road should be uniform, Councillor J. T. Wilson said when commenting recently on COSELEY Council's decision to approach the Ministry of Transport again to obtain permission to go ahead with an £18,000 scheme for lighting the Coseley section.

ELECTRICITY SUPPLY

Charges in Mining Area

Rural Supplies in South-West

PEOPLE living in the mining area of Mickley (Northumberland) are protesting against the high electricity charges imposed by the National Coal Board. One householder is stated to have received a bill for £10 3s for the consumption of 406 kWh. The National Coal Board, commenting on the matter, said that no profit whatever was made in the supply of electricity to Mickley. The Coal Board did not generate the electricity, but obtained it from the Electricity Board for reselling. The Coal Board's predecessors had erected the electricity lines from the pit to Mickley, a distance of three miles, and the capital expenditure involved had to be recovered by increasing the unit charge.

Domestic Equipment Decision

Blyth (Northumberland) Town Council's decision to install only gas boilers and gas cookers in new Council houses has brought a protest from the North Eastern Electricity Board, but the Council is not taking any action in the matter. Previously it was the custom to install gas and electric boilers and cookers in new houses on an equal basis.

Power Station Extension

Plans have been submitted to the York Corporation by the British Electricity Authority for the proposed extension of the Foss Islands Road generating station.

Two Somerset Villages Connected

Continuing the programme of rural development, the South Western Electricity Board's Bridgwater staff have connected two more Somerset villages, Stawell and Sutton Mallet. As usual, "switch-on" ceremonies, attended by crowds of villagers, were held in both places, and a demonstration and display of apparatus was held at Stawell village hall. A pole-line erection machine was used for the first time in this district to erect the 120 poles necessary to supply the thirteen farms, four commercial premises and 55 houses included in the scheme.

S.W. Scotland Charges

A move to get the S.W. Scotland Electricity Consultative Council to recommend that electricity consumers of the old Glasgow Corporation supply area should face an immediate rise from 2d to 4d in their primary tariff was successfully opposed by city representatives at the Consultative Council meeting in Ayr on 27th March. The Council then unanimously approved the proposals of the Electricity Board for raising tariffs on a graduated basis to meet rising costs and wipe out the outstanding deficit of £627,000.

Electric Pumping

In the course of a special report the Brighton waterworks engineer recommends that electrical plant shall be installed at the Patcham pumping station to pump from new deeper workings, leaving steam plant in reserve for winter work when water levels are higher. The capital required to carry out all the suggested improvements is estimated at £146,000. The Waterworks Committee has approved the scheme.

Council to Pay for Repairs

Stirling County Council has decided to pay for repairs to cookers in municipal houses. This reverses a decision made a year ago. Mr. F. Crawford, Airth, said that tenants were too poor to pay the cost of repairs and cookers were lying unused. Sir George Wilson, Killearn, observed that the Council provided the cheapest houses in Scotland and yet had the highest repair bill. Now they were proposing to spend £4,000 in maintaining electrical equipment.

Trolley-Bus Scheme Rejected

The Finance and General Purposes Committee of Bradford City Council has upheld a recommendation of its Estimates Sub-Committee that a proposal of the Transport Committee for the erection of overhead wires in Bridge Street at a cost of £1,774 to enable trolley-buses to go to Thornbury via Town Hall Street, Nelson Street and Union Street should be disapproved.

Sunderland Tramway Abandonment

Following a report that the tram lines are likely to need extensive renewal, Sunderland Corporation is replacing the trams on the High Street West to Kayll Road route and to Grangetown by motor-buses.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE B.B.C. announces the following new appointments in the Engineering Division: **Mr. H. W. Baker,** A.M.I.E.E., becomes superintendent engineer, television studios; **Mr. T. H. Bridgewater,** M.I.E.E., is appointed superintendent engineer, television outside broadcasts; **Mr. H. Walker,** O.B.E., A.M.I.E.E., becomes head of technical operations, television service; **Mr. M. H. Hall** is engineer-in-charge, television studios; and **Mr. W. D. Richardson** is appointed to the position of engineer-in-charge, television outside broadcasts.

Mr. H. G. Whiting, A.M.I.E.E., has relinquished his post as engineer-in-charge of the Sutton Coldfield television transmitting station to become assistant engineer-in-charge (television), Birmingham. **Mr. R. C. Harman,** A.M.I.E.E., assistant engineer-in-charge, has been appointed engineer-in-charge of the Sutton Coldfield station.

Mr. F. Axon, D.C.M., head of the Overseas and Engineering Information Department, becomes senior superintendent engineer, external services. **Mr. F. Williams,** B.Sc. (Hons.), M.I.E.E., superintendent engineer, Studios, becomes senior superintendent engineer, home broadcasting.

Mr. J. Scrivener, vice-chairman of Electrolux, Ltd., has retired at the age of seventy. He rose from being an apprentice with Siemens Bros. & Co., Ltd., to be head of Electrolux. In 1919 Mr. Scrivener founded the Z Electric Lamp & Supplies Co., Ltd., and obtained the selling agency in this country for Electrolux cleaners. Two years later Electrolux, Ltd., was founded in this country with Mr. Scrivener as its managing director. In 1927 the manufacture of refrigerators was started in the Luton factory.

Mr. J. Scrivener

Mr. J. H. R. Homfray

To fill Mr. Scrivener's place on the board, **Mr. J. H. R. Homfray** has been elected a director. Mr. Homfray was born near Llanelly in 1892 and before entering commercial life had a distinguished career in the Royal Navy. He entered the Royal Naval College, Osborne, in 1904, and became a midshipman four years later. During the 1914-18 war he served in submarines and was invalided from the Navy in 1920. In April 1926 he joined Electrolux as a refrigerator salesman. He was appointed refrigerator sales manager in 1928, a position he held until the outbreak of war in 1939, when he was recalled to the Navy and appointed to the Operations Division of the Naval Staff, working at the Admiralty, Whitehall, with the rank of commander. In 1942 he was awarded the O.B.E. (Military) and later was appointed Commander of H.M.S. *Valkyrie*, the radar training establishment on the Isle of Man. After the war Mr. Homfray re-joined Electrolux, Ltd., as refrigerator sales manager, and became general sales manager in 1946.

At the Council meeting subsequent to the annual general meeting of the Electrical Wholesalers' Federation, **Mr. W. H. Swain** was elected president of the Federation. Mr. Swain is a director of Hirst, Ibbetson & Taylor, Ltd., Manchester, and has the longest record of service on the Council, having been a member since 1937. He was president in 1945. At the same meeting **Mr. E. A. V. Peckham** was elected vice-president for the year. Mr. Peckham is managing director of G. S. Peckham & Co., Ltd., and has served on the Council since 1949.

Mr. W. H. Swain

Mr. H. Hall has retired from the position of manager of the Gillingham District of the South Eastern Electricity Board. Mr. Hall served in the Grimsby, Falkirk, Worksop, Dewsbury and Wakefield undertakings before going to the Southern Command in 1915 as deputy electrical engineer. He was appointed borough electrical engineer at Gillingham in 1923 and became district manager there upon nationalization.

At a farewell dinner to Mr. A. Bell, assistant manager and works controller of the Automatic Telephone & Electric Co., Ltd.

Left to right: Messrs. H. W. Barrett (general superintendent), W. S. Vick (works manager), H. Adams (programme controller), A. Bell (assistant manager and works controller), H. Monks (methods engineer), J. Mason (manager), V. T. Jones (production manager), A. Speight (superintendent) and A. Robinson (assistant chief inspector)

After over fifty years' service in the electricity supply industry, **Mr. E. G. Simmons**, M.S.M., A.M.I.E.E., retired on 31st March from the position of sub-area meter superintendent in the Mid-Sussex Sub-Area of the South Eastern Electricity Board. He joined the St. James & Pall Mall Co. in 1901, and subsequently held appointments at Heston and Isleworth and Hull. In 1911 he joined the Brighton Corporation electricity undertaking where he later became meter and test superintendent, a position he held until vesting date. Soon after nationalization he was appointed sub-area meter superintendent of the Mid-Sussex Sub-Area.

Before a large gathering at the Mid-Sussex Sub-Area headquarters, Mr. H. Pryce-Jones, M.Eng., Sub-Area manager, presented Mr. Simmons with a long service certificate, together with a silver tea set and a season ticket for the Sussex County Cricket ground. In the evening Mr. Simmons was entertained to dinner over which Mr. Pryce-Jones presided.

As the control of Henry Meadows, Ltd., of Wolverhampton, has now been acquired by Associated British Engineering, Ltd., **Major Gen. W. S. Tope**, C.B., C.B.E., has relinquished the chairmanship of Henry Meadows, Ltd., and **Mr. Alan P. Good**, has become chairman in his place. Major Gen. Tope is taking up other important duties in the Brush Aboe group.

Mr. C. Clubbe, machine shop superintendent at Brookhirst Switchgear, Ltd., Chester, has retired after fifty-one years' service with the company. At a farewell ceremony Mr. J. O. Knowles (joint managing director) presented him with an electric clock and cheque subscribed for by present and former colleagues.

Mr. A. Bell, assistant manager and works controller of the Automatic Telephone & Electric Co., Ltd., retired at the end of March. Mr. Bell was educated at Liverpool College and joined the National Telephone Co. in 1903. In 1913 he went to the Automatic Telephone & Electric Co., commencing as a draughtsman, and was soon promoted head of the power section. He served in the Signals Branch of the Royal Engineers in the 1914-18 war and in 1919 returned to the company, becoming superintendent of wiring operations in 1920. Early in 1922 he went to India to supervise the installation of an automatic exchange network in Bombay. In 1924 he became installation and operating manager and remained in this post until the outbreak of the last war. Coincident with the turn over of the works to defence contracts Mr. Bell was made works controller with the position of assistant manager. Since 1937 he has served as chairman of the company's sports and social organization.

At the recent annual meeting of the Batti-Wallahs' Society, **Mr. J. W. Perkins**, A.M.I.E.E., was elected president for the ensuing year, in succession to Sir John Hacking. Mr. Perkins, who is sales manager of Gresham Transformers, Ltd., received his training with Ferranti, Ltd., and has been associated with transformer manufacture for many years, having previously been with Foster Transformers & Switchgear, Ltd. For nine years he was engaged on mercury arc rectifier manufacture with the Nevelin Electric Co., Ltd.

Mr. J. W. Perkins

Mr. T. C. F. Bigland was re-elected hon. secretary and treasurer of the Society, and **Mr. J. Temple Hazell** was re-elected assistant

Mr. L. Howles presenting the Elizabeth Sloan Chesser Cup to Miss M. B. Marris. Seated (left to right) are Mr. C. L. Townsend (Western Sub-Area manager), Councillor Mrs. Letitia Bell (E.A.W. National Executive), Mr. E. Jones (deputy chairman South Wales Electricity Board), Mrs. A. Coulthurst (E.A.W. area organizer) and Mr. J. F. Smith (Board's chief commercial officer)

hon. secretary. The following members were elected to the Committee : Dr. L. G. Brazier, Messrs. M. D. Cloran, M.C., A. G. Freeborn, A. N. East, C.B.E., J. Nelson and J. W. Woolley.

Members of the Blyth (Northumberland) staff of the North Eastern Electricity Board recently made a presentation to **Mr. A. McPherson** to mark his retirement from the post of assistant district engineer. Mr. McPherson had been with the Board and the former supply company for 33 years of which 29 years were spent at Blyth. His successor is **Mr. J. Rutherford** of the planning and development section of the Tyne District of the North Eastern Electricity Board, Newcastle-on-Tyne.

To mark his retirement after twenty-seven years' service in the Forest of Dean district with the Midlands Electricity Board and the former West Gloucestershire Power Co., **Mr. L. Coulon,** district consumers' engineer, was presented with a wrist watch on 8th April. The presentation was made by Mr. D. Holt, manager of the Central Gloucestershire Sub-Area.

E.M.I. Sales & Service, Ltd., announces the appointment of **Mr. W. H. Perkins,** O.B.E., M.Sc., as educational adviser. Mr. Perkins, who was formerly Director of Education for Warwickshire, succeeds **Mr. A. C. Cameron,** M.C., M.A., who has resigned on medical advice.

Elliott Brothers (London), Ltd., announce that **Mr. J. F. Coales** has resigned his position as research director of the company.

At the Royal Hotel, Cardiff, on 31st March the Elizabeth Sloan Chesser Cup, awarded by the Electrical Association for Women to the demonstrator securing the highest marks each year in the Association's Diploma for Electrical Housecraft, was presented to **Miss M. B. Marris** of the Carmarthen electricity showrooms of the South Wales Electricity Board. This is the first time that this award has gone to Wales. The presentation was made by Mr. L. Howles (chairman of the Board).

In our last issue we reported that Mr. W. M. Furniss, chairman and managing director of the Electric Construction Co., Ltd., had been appointed to the Midland Regional Board for Industry. Actually the appointment was of **Mr. W. M. B. Furniss,** assistant managing director of the company.

Mr. E. T. Judge has been appointed a part-time member of the North Eastern Electricity Board. **Mr. G. A. S. Nairn,** M.B.E., has been re-appointed a part-time member of the Merseyside and North Wales Electricity Board and **Mr. W. Newcome-Baker** has been re-appointed to the Eastern Electricity Board.

Mr. A. Deutsch, A.M.I.E.E., a director of Thorn Electrical Industries, Ltd., left London Airport on 13th April on a tour embracing Ceylon, Malaya, Australia, New Zealand and the United States on business connected with the company's export activities and the expansion of manufacturing facilities overseas.

The following awards have been made by the assessors of the essays submitted by the 1951 students for the Worshipful Company of Tinplate Workers' travelling sholarships. The first prize, presented by the High Conductivity Copper Association, is awarded to **Mr. J. Hudman,** Imperial Chemical Industries, Witton (firm visited, Yarrow & Co., Ltd., Glasgow). The winner of the second prize, presented by the Cable Makers' Association, is

Mr. A. **Smith,** British Insulated Callender's Cables, Ltd., Prescot (firm visited, Yarrow & Co., Ltd.). The third prize is presented by the Electrical Trades Union, and has been awarded to **Mr. K. D. Harrower,** R.N. Aircraft Repair Yard, Donibristle, Fife (firm visited, British Insulated Callender's Cables, Prescot).

Mr. **Charles A. Brearley,** M.I.E.E., head of the Department of Electrical Engineering at Loughborough College, Leicestershire, is to retire on 30th April. He is treasurer of the East Midlands Centre of the I.E.E.

Mr. **W. Laidler,** assistant engineer at Newcastle-on-Tyne General Post Office, has retired and has received a presentation from his colleagues.

Meaks & Crane, Ltd., announce a regrouping of their sales organization. **Mr. Gordon Eyre** is appointed general sales manager, **Mr. P. A. H. Luttrell,** sales manager for the London area and **Mr. W. Duckett,** Northern area manager, Manchester.

A party of 320 employees of the Witton works of the **General Electric Co., Ltd.,** with their wives and families, spent the Easter week-end on the Continent with Paris as the rendezvous. Nine coaches were requisitioned for road transport and arrangements were made with the British and Belgian Railways for chartering a special ferry to take the passengers and coaches from Dover to Ostend. From Ostend the party travelled via Ypres arriving in Paris for lunch on Saturday. Over the week-end there were organized trips around Paris, Versailles and Fontainebleau. The return journey was made via Cambrai and the tourists arrived home at about midnight on Tuesday. A B.B.C. recording unit accompanied the party and the recordings are to be broadcast in May in the Midland Region programme.

The **G.E.C. Witton Apprentices' Association** held its annual dinner at the Magnet Club on 5th April, when over 300 apprentices and guests were present. Among the guests were Mr. T. W. Heather, M.C., a director of the company, Professor E. B. Moullin, Professor of Electrical Engineering at Cambridge University, and members of the management at Witton. The toast of the G.E.C., to which Mr. Heather responded, was proposed by this year's chairman of the Association, Mr. J. Harbord. Mr. J. Collier, a student apprentice and social secretary, proposed the health of the guests to which Professor Moullin replied and the speeches closed with the toast of the Apprentices' Association, proposed by Mr. J. W. Laing, chief engineer, Witton Engineering Works, and replied to by Mr. J. Bent, secretary of the Association. Then followed the presentation of awards by Mr. Heather.

Mr. T. W. Heather, M.C., making a presentation to Mr. D. L. Davies. On the left is Professor E. B. Moullin

The winners of this year's awards were Messrs. S. Davis, W. R. Cochrane, J. R. Parker, T. O. Jones, D. L. Davies and P. L. Cowie.

Recently the Sports and Social Club of **Johnson & Phillips, Ltd.,** held its first sportsmen's dinner and smoking party for more than twenty years. The function was held in the company's works canteen and was attended by some two hundred members of the club and their friends.

OBITUARY

Mr. H. Dawson Roberts.—The death on 11th April is announced of Mr. Harold Dawson Roberts, commercial manager, Affiliated Manufacturers' Associations, Cable Makers' Association. Mr. Roberts was born in Liverpool in 1892 and attended the Liverpool Institute. During the 1914-18 war he served with the King's Regiment, holding the rank of captain. In 1919 he joined British Insulated Helsby Cables, Ltd., and in 1929 was transferred to the company's London office.

Mr. J. H. Dunbar, who has died in Hospital at West Kilbride, was formerly chief electrical engineer in London for the Eastern Telegraph Co.

Mr. R. N. Ballard.—The death occurred on 8th April, following a heart attack, of Mr. R. N. Ballard, branch controller of Simms Motor Units, Ltd.

Mr. E. C. Hopkins.—The death occurred on 6th April, at the age of eighty-one, of Mr. Edmund Charles Hopkins, A.M.I.C.E., A.M.I.E.E., of Gerrard's Cross.

WILLS

Mr. J. H. Wilkinson, a partner in the firm of W. Wilkinson & Co., electrical engineers, Halifax, who died on 16th October last, intestate, left £6,041 gross (£6,000 net).

Mr. P. C. Ebner, A.M.I.E.E., formerly borough electrical engineer at Shoreditch, who died on 20th December last, left £3,990 gross (£3,852 net).

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Nationalized Inertia"

MOST former engineers and managers of electricity undertakings will, I feel sure, endorse the observations of "Bunkered," "Disillusioned" and others who have given your readers a peep into some of the more obvious defects of the nationalized industries. Instead of being able to exercise that initiative and individuality which enabled them to contribute so much to the development of this important and once-efficient industry they now have to conform to elaborate procedures involving endless paper work much of which appears to have been devised by people who have no practical acquaintance with what, after all, is the main purpose of an electricity undertaking, i.e., the distribution and supply of electricity.

This "blowing-off of steam" in your valuable paper affords a measure of satisfaction to contributors and readers alike, but if anything practical is to be done to rescue our industry from the dead hand of the present top-heavy administration and restore to its personnel some of the former enthusiasm for "continuity of supply" and "service to consumers," these views will have to go further than your columns.

Would it not be possible for a precis of the various contributions to be sent to the Minister of Fuel and Power and editors of the national newspapers?

"MUNICIPAL."

Alternative Systems of Wiring

"COMMENTATOR'S" article on "House Wiring" in your issue of 4th April, 1952, should evoke a controversial, but nevertheless welcome, discussion in your correspondence columns on the various substitutes that are being suggested for the h.g. screwed steel conduit system.

For some years I have included h.g.s.s.c. in my specifications for houses, flats and buildings—public and otherwise—as a reliably safe system. At the present time I am engaged on a contract on which the building work is nearing completion with h.g. screwed steel conduit installed in concrete "pot" flooring and I am requested to agree to lug-grip slip conduit to avoid delaying building operations.

Although the latter conduit complies with the specified smooth bore (which, I should imagine, would be unattainable by a duct in concrete obtained by withdrawable rubber tubes) and the conduit ends are well butted and measures adopted to avoid ingress of wet plaster, etc., with possible corrosive ingredients, I would advise an additional conductor throughout the run for earthing purposes as slip conduit has not the advantage of the ample clean contact area of the screwed type.

Assuming impossibility of obtaining steel conduits the answer would seem to be the provision of an inexpensive smooth-bore non-corroding, non-metal conduit of indestructible and non-compressible material with suitable couplings, which can be installed without special tools and specially trained men and left permanently bedded in the concrete, well below the finished floor surface (I know of cases where steel conduit runs have become exposed in concrete floors subjected to hard wear).

One has to bear in mind that an architect may raise objections to what he might regard as weakening of the floor by ducts lacking steel conduit "reinforcement."

The weakness of buried systems without ducts lies in the difficulties of renewals involving cutting away and making good. One may visualize renewals in part on the surface to avoid this mess, resulting eventually in a complete changeover to a surface installation.

Shirley, Croydon. J. E. ELVY, A.M.I.E.E.

MacColl Memorial

A memorial plaque to the late Sir Edward MacColl, deputy chairman and chief executive officer of the North of Scotland Hydro-Electric Board, was unveiled at Pitlochry power station last Monday by Lord Cooper, Lord Justice General.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

W. T. Henley's Telegraph Works Co., Ltd., reports group profits, after taxation, of £64[illegible],447 for 1951, as compared with £685,559 for the preceding year. Taxation absorbed £7[illegible],197 (against £731,676). General reserve receives £50,000, replacement of buildings and machinery £250,000, and fluctuation in prices of materials £200,000. It is proposed to pay a final ordinary dividend of 10 per cent and a bonus of 5 per cent, maintaining the distribution for the year at 20 per cent. The balance carried forward is £927,000 (against £953,477 brought in).

A. Reyrolle & Co., Ltd.—Preliminary figures for 1951 were given in our last week's issue. The report and accounts now published show a consolidated trading profit of £2,099,622, as compared with £1,747,464 for 1950, and after deducting all charges, including £1,175,000 for taxation, there is a profit of £902,059. Of this £5,161 is retained in the accounts of subsidiary companies, leaving a profit applicable to the parent company of £896,898 (£775,495). General reserve receives £223,345, development expenditure account £200,000, and after making other allocations, it is proposed to pay a final dividend of 6¼ per cent on the ordinary stock, as increased by the bonus issue last October. This, with the 7½ per cent interim, is equivalent to 20 per cent for the year on the old capital. For 1950 the dividend was 15 per cent. The balance carried forward is £335,881 (against £252,350).

In his statement which accompanies the report and accounts, Sir Claude D. Gibb (chairman) says that shortage of essential materials prevented their reaching the high targets of production set for 1951. Many shortages and other difficulties were overcome by foresight and improvisation and it was to the credit of the whole organization that the output for the year, both in value and in volume, was the highest in the history of the company. The value of orders received in 1951 established a new record. Home orders, which made up about 60 per cent of the total, included power station equipment for the British Electricity Authority, switching stations for the Electricity Boards, flameproof equipment for the National Coal Board and oil refineries, and large contracts for switchgear in connection with atomic energy developments and for industrial use. The increase in orders from overseas was consistent in all territories.

During the year A. Reyrolle & Co. (Rhodesia), Ltd., was formed with an issued capital of £5,000. The increase in trade investments included an interest acquired in one of their suppliers of copper wires; the balance was a first call of 10s per share on 60,000 additional shares in the Bushing Co., Ltd. This company was extending its factory to meet rapidly rising demands. It was owned jointly by the General Electric Co., Ltd., and themselves, and additional finance would have to be provided in due course to complete and equip the extensions. By far the largest item in trade investments was their holding in C. A. Parsons & Co., Ltd., which company had had another successful year.

The Telegraph Condenser Co., Ltd., reports a trading profit for 1951 of £468,319, as compared with £329,942 for 1950, which with other income makes £471,511. After meeting all charges, including taxation of £164,093 and placing £150,000 to general reserve, it is proposed to pay a final ordinary dividend of 15 per cent, making 20 per cent for the year. The distribution is at the same rate as the preceding year but is paid on capital increased in May last.

At an extraordinary general meeting, which it is hoped to hold in June, the directors will propose that a further £50,000 of the undivided profits of the company should be capitalized and applied in paying up in full 100,000 new 10s ordinary shares, to be issued to ordinary shareholders in the proportion of one new share for every four held.

In his statement accompanying the report and accounts, Mr. P. V. Hunter (chairman), says that incoming orders, both in volume and value, during the year under review were the highest ever recorded in their history. The new wing at their Bathgate factory will commence production during the second half of the current year. Their turnover exceeded that for the previous year by a substantial amount in spite of acute shortage of certain raw materials. Sales to overseas customers were higher than in 1950. Conditions have steadily become less favourable, however, and it may not be possible to maintain the export turnover at the same level during 1952. During the last quarter of 1951 and during the first few months of the current year, there has been a marked falling-off in requirements for their products within the radio industry, the increase in purchase tax imposed on radio and television sets by the April, 1951, Budget being a severe blow to manufacturers in that industry.

The Telegraph Construction & Maintenance Co., Ltd.—An abstract of the chairman's statement accompanying the report and accounts for 1951 was published in our issue of 28th March. Speaking at the annual meeting held on 8th April, Lord Colgrain said that the company needed further capital. Should it be decided to make a "rights" issue to shareholders, he thought they would agree that the figures submitted in the profit and loss account indicated that the distribution of profits to shareholders would not be adversely affected. It was not possible to say when the issue would be made. It depended on market conditions, Treasury consent and various other things.

Kerry's (Great Britain), Ltd., report a group profit for 1951 of £234,790, as compared with £140,053 for 1950. Taxation absorbs £132,412, and after allocating £6,000 to pensions and £45,000 to reserve, it is proposed to pay a final dividend of 10 per cent, maintaining the distribution for the year at 15 per cent.

Enfield Rolling Mills, Ltd., announces trading profits of £1,076,453 for 1951 (against £732,605) and a net profit of £809,861 (£404,742). The ordinary dividend is raised from 5 to 7½ per cent and the 5 per cent bonus is again to be paid. The amount carried forward, after placing £350,000 (against £250,000) to reserve and £8,957 (£25,000) to staff pension fund, is £125,710 (£104,511).

Sangamo Weston, Ltd., in a preliminary statement, reports a trading profit for 1951 of £128,057, as compared with £310,260 for the previous year, and a net profit of £33,167 (against £114,614). The dividend for the year is unchanged at 12½ per cent, and the balance carried forward is £363,246 (against £350,751 brought in).

G. & J. Weir, Ltd., report a net consolidated surplus for 1951, after deducting £749,822 for taxation, of £494,493, as compared with £491,991 for 1950. The parent company's net profit is £339,202 (against £326,724), less provision for loss incurred by a new subsidiary of £25,000. The final dividend is 30 per cent, making 40 per cent for the year, plus a bonus of 5 per cent (both unchanged).

The Telephone & General Trust, Ltd., is to offer 373,000 ordinary shares of £1 each at 23s per share to ordinary and "A" ordinary stockholders, in the proportion of one new ordinary share for each £2 of ordinary or "A" ordinary stock held. The new ordinary shares, when fully paid-up, will rank *pari passu* in all respects with the existing ordinary stock (except that the holders will not participate in any dividend in respect of the financial year ended 31st December last). They will be converted into stock. Ordinary and "A" ordinary stockholders are invited to apply for the balance of the shares (9,573 shares) and for any balance of new shares which may not be taken up by the provisional allottees.

The British Vacuum Cleaner & Engineering Co., Ltd., is maintaining its ordinary dividend at 25 per cent for the past year.

Brook Motors, Ltd., has declared an interim dividend of 5 per cent (unchanged).

New Companies

Radio Services (Dorset), Ltd.—Registered 1st April. Capital £5,000. Manufacturers, repairers and hirers of and dealers in electrical and mechanical apparatus and accessories, wireless and television sets, etc. Directors: D. R. Hills, J. U. Griffen and P. B. Reade. Regd. office: 17a, Christchurch Road, Bournemouth.

M. A. Salter, Ltd.—Registered 26th March. Capital £500. Manufacturers of and dealers in electrical goods, wireless and television sets, etc. Directors: M. A. Salter and D. B. Salter. Solicitors: J. E. Binstock Miller & Co., 169, Great Portland Street, W.1.

T. V. Radio Co. (Plymouth), Ltd.—Registered 26th March. Capital £1,000. To acquire the business of wireless, television, electrical, motor and refrigeration engineers carried on by Jas. T. & Lilian C. Howard at Plymouth, as "J. T. Howard & L. C. Howard." Directors: J. T. Howard and Lilian C. Howard. Regd. office: 15, King Street, Plymouth.

Kensal Electrics, Ltd.—Registered 28th March. Capital £500. Electrical equipment specialists and manufacturers, etc. Directors: J. H. Dale and Mrs. Marjorie F. Dale. Regd. office: 151, Kensal Road, W.10.

Liquidations

J. H. Payne (Birmingham), Ltd., electrical contractors.—Liquidator, Mr. W. L. Hand, Fletchers Chambers, Fore Street, Birmingham, 2, appointed 1st April, with a committee of inspection.

Haden Electrical, Ltd.—Members' voluntary winding-up. Particulars of claims by 22nd April to the liquidator, Mr. R. M. Patel, 1-2, Queen's Gardens, London, W.2. Meeting on 5th May at 65, Vincent Square, Westminster, S.W.1, to receive an account of the winding-up by the liquidator.

Bankruptcies

L. F. Kent, 32, High Street, Broadstairs, Kent, radio and electrical engineer.—Trustee, Mr. H. C. Treby, 29-30, High Holborn, London, W.C.1, released 18th March.

G. S. Douthwaite, 25, Dean Street, Newcastle-on-Tyne, electrical engineer.—Last day for receiving proofs for dividend 30th April. Trustee, Mr. R. F. Howe, Gibb Chambers, 54, Westgate Road, Newcastle-on-Tyne.

STOCKS and SHARES

SHARE prices at the resumption of business after the holiday reflected the better tendency established during the preceding fortnight, which is the period covered, this time by the accompanying price-lists. The two per cent British Electricity stocks moved up by a point or more. To this lead from gilt-edged prices may be credited much of the improvement in industrials. British Aluminiums stand out with a rise of 6s on the strength of the increase in profits and dividend. Tube Investments' bonus news caused a jump of 4s in the shares concerned. Some of the electrical equipment leaders put on two to three shillings; they include Westinghouse Brakes and Murex (both 3s higher), Chloride Electric, English Electric and A.E.I. Cable manufacturing and radio shares were also in favour, while British Vacuum Cleaner hardened on the dividend and profits statement.

Henley's Results

Group profits of W. T. Henley's Telegraph Works for 1951 come out a little lower than the previous year's, but remain more than ample to provide for the maintenance of the ordinary distribution at a total of 20 per cent, and for further large additions to general and specific reserves. These are reaching proportions which begin to dwarf the issued capital of £1·8 million; the general reserve and carry-forward alone will amount now to some £3¼ million, and in special accounts there are formidable provisions against replacement costs, price fluctuations and contingencies. Inevitably a position of this strength keeps market minds running on the question of a capital bonus sooner or later. It is a factor also in the quotation of the £1 ordinary shares on the comparatively modest yield basis of about 5¼ per cent.

Reyrolle Earnings

Full accounts now published by A. Reyrolle show that from the year's profits the stockholders receive £127,000 net in dividends, while taxation collects over a million more than that, and an amount of £628,000 is appropriated to reserves. Sir Claude Gibb, in his review, disarms any criticism which might be made on the score of over-conservatism, by reference to the Chancellor's request for restraint in that respect. Justification for the dividend policy appears substantially also in the balance sheet, in which a big expansion in stocks and work-in-progress is shown to have been achieved without impairing a very strong cash position. This is recognized in the quotation of the shares at 43s. At that figure, the yield is £4 13s per cent on the total dividends actually paid for the past year, which were equivalent to 10 per cent on the present capital, but would be 6 per cent if the final of 6½ per cent should prove to signify 12½ per cent for the year.

Cable Shares

Excellent figures produced in the last annual accounts by Telegraph Construction and Maintenance, and the chairman's reference in his speech last week to the company's association in joint enterprises with Johnson & Phillips and Siemens Bros., focus interest on the dividends and results due to be declared shortly by those concerns. A year ago Siemens added a 2½ per cent bonus to their long line of 7½ per cent dividends, and the total of 10 per cent was covered about three times by distributable earnings. Johnson & Phillips also earned about 30 per cent cent in 1950, and paid 15 per cent on the ordinary. The shares of all three have been firm in recent weeks. On the latest rates of dividend, T.C.& M. at 34s 6d and Siemens at 35s yield a little either side of 5¾ per cent, while Johnson & Phillips at 47s 6d give 6·3 per cent.

Radios

A. C. Cossor 5s shares have remained a firm and active market since the company's clearance of the preference dividend arrears. Quoted previously at 10s 9d, the shares are now 1s 9d higher. It will be a month or two before the answer appears to speculation about the chances of an ordinary dividend for the first time since 1947. Murphy Radio 5s shares have hardened to 6s 6d, since the appearance of the preliminary profits statement, which showed group net earnings, after tax, to have been more than doubled at £168,000. Dividend on the £500,000 ordinary capital is again 10 per cent, the rate paid since the company was made public. Last year, there was mention of a capital issue for cash, and the full annual report will no doubt show how far the past year's profit retentions may have affected matters from that point of view. McMichael Radio 5s shares advanced to 3s 3d in anticipation of the dividend.

Preference Shares

Bank Rate changes, and the necessary adjustment of prices in the gilt-edged market, react directly, of course, on preference share quotations. These have fallen consequently to the point at which they can be said at least to be attracting more attention than they have received for a long time; for they were out of favour during the inflationary part of last year, and again during the post-Election phase of rising interest rates. Being deflationary in intent, however, present official policies are being used as part of the argument that events are tending in any case to reduce the disadvantage at which preference shares were standing in relation to ordinary shares.

Electrical Investments

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price April 15, 1952	Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks			£ s d		
Brit. Elec. 1968/73	3	3	85	+1	3 12 3
Brit. Elec. 1974/77	3	3	82	+1½	3 13 2
Brit. Elec. 1976/79	3½	3½	88	—	3 8 2
Atlas Elec. ..	3	4	18/6	+1/6	4 6 6
Calcutta Elec. ..	6†	6†	19/6	—	6 3 1†
East African Power	7	7	28/3	−6d	4 19 1
Nigerian Elec. ..	10	10	25/3	−6d	7 18 5
Palestine Elec. "A"	5†	5†	13/9	−9d	7 5 6†
Perak Hydro-Elec.	Nil	Nil	12/-	−6d	—
Equipment and Manufacturing					
Aberdare Cables(5/-)	20	20	11/6	−1/-	8 13 10
Aerialite (1/-) ..	83½	88½	8/3	−6d	10 14 0
Aron Elec. Ord. ..	15	15	35/-	—	8 11 6
Assoc. Elec. Ord.	20	20	68/6	+2/-	5 16 0
Automatic Tel.& El.	12½	15	55/3	+3d	5 8 4
Babcock & Wilcox	15	18	65/9	+1/9	5 9 9
Baldwin, H. J. (2/-)	25	25	4/9	—	10 10 6
British Aluminium	10	12	40/9	+6/-	5 17 8
B.I. Callender's ..	6⅝	7½	26/6	+1/6	5 14 3
British Thermostat (5/-)	30	30	27/-	—	5 11 1
British Vac.Cleaner (5/-)	25	25	11/-	+6d	8 18 6
Brook Motors ..	20	20	32/6	—	6 3 1
Brush Ord. (5/-) ..	10	10	5/6	+3d	9 1 10
Burco (5/-) ..	42½	38½	18/9	−1/6	9 18 6
Chloride El.Storage	12½	15	57/6	+½	5 4 1
Cole, E. K. (5/-) ..	20	25	15/-	+3d	6 13 4°
Cossor, A. C. (5/-)	Nil	Nil	12/6	+1/6	—
Crabtree (10/-) ..	17½	17½	31/3	—	5 12 0
Crompton Parkinson Ord. (5/-) ..	11¼	11½	8/9	—	6 8 9
De La Rue (5/-) ..	50	50	15/9xr	—	8 2 8
Decca (1/-) ..	112½	112½	17/6	+1/6	6 8 6
E.M.I. (10/-) ..	8	12	15/6	+9d	7 14 10
Electrical Components (5/-) ..	20	20	11/3	—	8 17 10
Elec. Construction	15	15	47/6	—	6 6 3
Enfield Cable Ord.	7½	7½	26/-	+1/-	5 15 5
English Electric ..	15	15	54/6	+2/-	5 10 1
Ericsson Tel. (5/-)	22†	22†°	37/6	+2/-	2 18 9†
Ever Ready (5/-)	35	35	24/-	+6d	7 5 10
Falk Stadelmann	15	15	37/6	−½	8 0 0
G.E.C. Ord. ..	17½	22½	78/-	+1/-	5 15 4
General Cables (5/-)	38	30*	17/6	—	8 11 6
Greenwood & Batley	15	15	11/3	—	7 5 0
Hackbridge Cable (5/-)	20	20	10/3	—	9 15 0
HackbridgeHewittic (5/-)	15	18	14/6	+9d	6 4 2
Hall Tel. Acc. (10/-)	10	10	11/6	—	8 13 10
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (5/-) ..	20	20	19/-	+1/6	5 5 3
Hoover (5/-) ..	37½	35*	25/3	+6d	6 18 7
Intl. Combustion (5/-)	20	25	21/9	+1/6	5 15 0
Johnson & Phillips	15	15	48/3	+2/-	6 4 6

Company	Dividend Previous	Dividend Last	Middle Price April 15, 1952	Rise or Fall	Est Yield p.c.
Equipment and Manufacturing (continued)			£ s d		
Lancashire Dynamo	22½	22½	10/6	—	5 11 1
Laurence, Scott(5/-)	12½	12½	10/6	—	5 19 0
London Elec. Wire	10	10	37/6	—	5 6 8
J. Lucas	17½	7½°	31/3	+6d	4 16 0
Mather & Platt ..	12½	12½	43/9	+¼	5 14 2
Metal Industries ..	10	10	36/6	+1/6	5 9 7
Mid. Elec. Mfg. ..	15	15	56/3	+¼	5 6 9
Murex	10	12½	47/6	+3/-	5 5 3
Newman Ind. (2/-)	10	6	2/9	—	—
Oldham & Son (1/-)	30	30	4/3	—	7 1 3
Parsons, C. A. ..	15	15	45/-	−⅛	3 6 8°
Plessey (5/-) ..	20	22½	16/3	—	6 18 6
Pye Deferred (5/-)	35	18°	17/-	+1/6	5 6 0
Revo (10/-) ..	27½	27½	32/6	+⅛	8 9 3
Reyrolle	15	10*	43/-	+3/-	4 13 0°
Scot. Cable (1/-) ..	30	30	20/3	+1/-	5 18 5
Siemens Ord. ..	7½	10	35/-	+3/-	5 13 8
Switchgear & Cowans (5/-)	22½	22½	13/-	—	8 13 3
T.C.C. (10/-) ..	15	20	45/-	—	4 9 0
T.C. & M. ..	10	10	34/6	+9d	5 16 0
TelephoneMfg.(5/-)	10	10	7/6	+3d	6 13 4
Thorn Elec. (5/-)..	20	10°	8/3	+6d	6 1 3
Tube Investments	25	25	5½	+10/-	4 11 0
Vactric (5/-) ..	Nil	Nil	5/9	−⅛	Nil
Veritys (5/-) ..	2½	Nil	3/6	—	Nil
Walsall Conduits (4/-)	70	70	47/-	—	5 19 2
Ward & Goldstone (5/-)	44	45*	36/3	—	6 0 0
Watford (2/-) ..	20	25	5/9	—	8 14 0
Westinghouse Brake	14	14	47/6	+3/-	5 18 0
West, Allen (5/-)	10	12½	10/-	+3d	6 5 0
Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	—	86	+1½	—
Ord.	—	—	58	—	—
Anglo-Portuguese	8	8	21/3	—	7 10 7
Brit. Elec. Traction: Def. Ord. ..	22½	25	415	+70	6 0 6
Cable & Wireless: Ord.	6	8	110½	+3	7 4 10
4% Loan ..	4	4	96½	+1½	4 1 3
Calcutta Trams ..	6†	6†	22/-	−6d	5 9 1†
Cape Elec. Trams	4	5	12/6	—	8 0 0
Globe Tel. & Tel. Ord.	—	—	23/6	+1/6	—
Inter. Tel. & Tel.	Nil	15cts	34	+1	—
Marconi Marine ..	7½	16	27/6	—	7 5 6
Oriental Tel. Ord.	16	16	52/6	+6/3	—
Telephone Props.	7	8	28/9	—	5 11 1
Tele. Rentals (5/-)	10	10	7/6	+3d	6 13 1

* After capital bonus.
† Dividends are paid free of Income Tax.

Guides to Colour Harmony

Application in Lighting Design

By **A. H. OLSON**, B.Sc., A.C.G.I., A.M.I.E.E.*

COLOUR harmony in design and decoration depends largely on the knowledge and careful planning of the effects of colour. The technical skill of the lighting engineer provides the designer with the means to accomplish the concepts of his design, and any practical guide for the selection and use of harmonious colours is useful if it is appreciated that purely mechanical methods cannot be substituted for creative ability.

In the past, numerous systems consisting of the scientific arrangement of coloured "chips," or charts, have been put forward to specify colour, and in recent years we have seen the introduction of guides to colour harmony based on these systems. These collections of coloured chips are most useful, particularly as they enable us to arrive at a more orderly and practical concept of colour relationship. It is proposed to deal with three well-known systems, each differing in its approach to the problem.

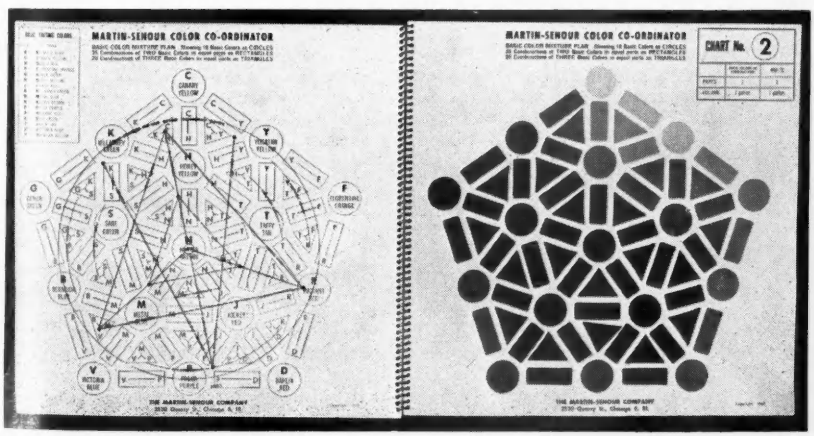
*Managing Director, Courtney, Pope (Electrical), Ltd.

The Munsell system, probably the most useful and well-known in this country, is based on equal distance steps in visual differences. The Ostwald system is different in its approach as it comes under the category of a colour mixture, whilst the Martin Senour colour co-ordinator is based on a systematic mixture of paints.

The Martin Senour co-ordinator system of colour chips illustrates the effects of pigment upon each other when mixed in various proportions and added to specific quantities of white. There are 497 colours presented in seven complete colour charts of actually painted chips. Each chart of seventy-one colours is arranged in a simplified and diagrammatical scheme, as illustrated in Fig. 1. Each of the charts represents a different level of brightness. The colours are steps in a systematic pentagon chart arranged with colour samples placed at measured intervals.

There is also a transparent plastic mask with set lines inscribed on its surface for denoting hue relationships. This mask is placed over the chart and rotated around

Fig. 1.—Martin Senour colour co-ordinator



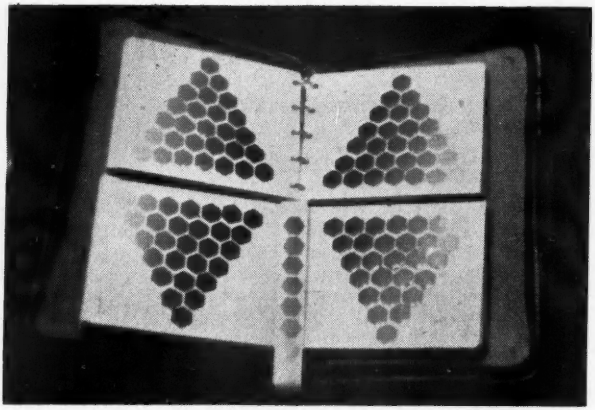


Fig. 2.—Colour Harmony Manual

the centre of the pentagon, selecting various harmonious relationships.

Wilhelm Ostwald, a physical chemist, put forward a system based on a colour solid in which achromatic colours form the common axis, having white at the top, the greys in between and the black at the bottom. All the chromatic colours, such as yellow, blue and green, are arranged in the hue circle in the form of a double cone on the common basis. Complementary hues are opposite and the solid is made up of pairs of complements with all the mixtures between them.

The Colour Harmony Manual produced by the Container Corporation of America divides the spectrum into twenty-eight hues; 973 colour chips are presented and thirty loose leaf charts are arranged in the leather binder as portrayed in Fig. 2. Each chart represents a hue triangle, with all the chips corresponding to that particular hue arranged in diagrammatical steps with progressively more white on one side, and more black on the other, these being known as the " light clear " and " dark clear " series. Principles of colour harmony are obtained by utilizing equal intervals and varying sequences, diagonally or vertically, for given hue triangles. Two-, three- and multi-coloured harmonies are presented for direct contrast, with complementary hues diagrammatically opposite and various intermediate steps for less vivid contrasts.

A Boston artist and painter, Albert H. Munsell, described the colour tree as made up of three variables—hue, value and chroma. Hue is the name of the colour, such as red, blue, green; value is the degree of lightness or darkness of colour, ranging from white to black; and chroma is the purity of the colour as compared with the greys of the same value.

The Munsell Color Company of America has produced various editions of colour chips based upon this colour tree. Charts are available containing the arrangement of these colour chips according to constant value, constant chroma and constant hue arrangements. A series of movable chips are pasted on separate pieces of card, enabling various colour schemes to be tried out. Selections of orderly colour relationships such as contrasting hues of high chroma, the use of one or more hues contrasting with a dominant hue, are suggested.

Mention should be made of the value scale which enables an estimate of reflectance to be made by judging colours by the eyes in terms of how light or dark it appears. Colours under test are compared with selected chips on a reflectance value chart (Fig. 3), which is calibrated in scales to show the direct value of reflectance for three different illuminants. This is of great assistance to the lighting engineer, as efficiency and brightness contrasts are directly affected by the luminous reflectance.

The decimal notation of the Munsell system is another important feature, as the scales are in equal stepped intervals and allow colour to be specified by the layman.

In recent years methods have been developed for converting measurements made by the less easily understood chromatic methods in terms of the I.C.I. system, into the Munsell terms of hue, value and chroma, by use of large scale conversion diagrams.

In all systems of colour chips, it is important to observe basic principles when

selecting colour. Consideration must be given to the background against which the chips are viewed. If the background is coloured it will obviously affect the colour of the chips. Colour relationships are also disturbed by comparative areas: a wall will appear to have a much stronger hue than that of a small colour chip.

The amount of light has an important effect on the appearance of colour; at lower levels of illumination colour cannot be distinguished, while at higher levels the apparent value of colour in a colour chip is increased.

Consideration must also be given to the normal reaction of the eye, for essentially yellow, orange and red hues are warm, stimulating and advancing colours, whilst blue, green and turquoise are considered to be cool, restful and receding.

Fatigue of the colour sensitive cells of the eye results in after-image and the eye receives colour impressions complementary to the first colour. If one looks at a red surface and then glances away, a green patch will be seen before the eyes.

The introduction of the various fluorescent light sources, producing different colour qualities, have brought problems of colour distortion. The spectral distribution curves of these lamps indicate the amount of energy in the different colour regions of the spectrum. The colour of any object depends upon its absorption of certain rays of the spectrum and its reflection of other rays to the eyes of the observer.

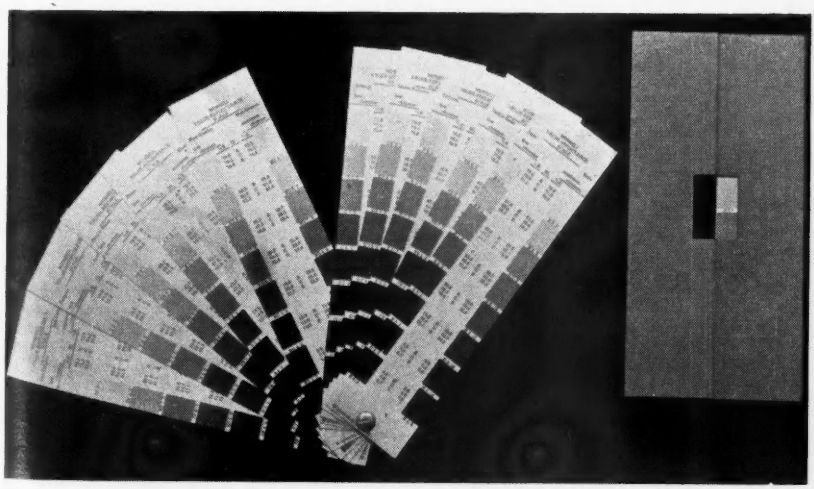
The peculiar colour effects obtained with fluorescent light sources on common objects such as vegetables, meat, tea and the human complexion, are caused by the combination of the absorption bands with the spectral distribution rays of the light sources.

It is important that a selected light source should contain rays that can be reflected from a chosen surface. If there is a peach wall in a restaurant, it would be wrong to install daylight lamps for the colour of the wall will appear dull because of the insufficient red, yellow and orange rays in the lamp source.

It is felt that there is a need for a simple chart of colour chips of the main primary colours, with corresponding chips illustrating the colour change by their different appearances under the new fluorescent lamp sources. Such a chart would be of assistance to the lighting engineer, and would also tend to eliminate the installation of fluorescent lighting in the wrong places.

Mention should be made of the part played by the paint manufacturers. In America, a large number of manufacturers have had their paints listed to correspond

Fig. 3.—Munsell reflectance value chart



with the colour chips of the Munsell and Ostwald systems, whilst the Martin Senour Paint Company has issued the co-ordinator system, giving the proportions for different paints to be mixed to correspond with their colour chips.

In this country there is nothing readily available at present, although some paint manufacturers will give their equivalents to the colour systems enumerated on application. Charts have been issued of the British Standard Code of Colours which, however, are not followed by all manufacturers, but no attempt up to now has been made to present any practical guide to harmony.

Undoubtedly we shall see these physical guides introduced in this country before long. They are useful in assisting the designer, decorator, architect, and lighting engineer as they provide an easy method of selecting colours in a systematic manner instead of choice being based on personal experience and preferences.

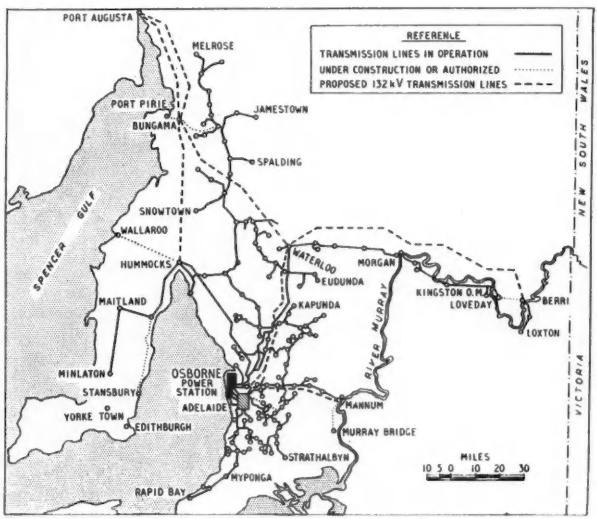
These new methods are strides in the right direction as they bridge the gap between theoretical colour systems and practical application to selected areas. The important relationship between light and colour is brought to the fore. It must be stressed, however, that these are only physical guides and that creative ability must always be the prime factor of a colour harmony design.

Supply in South Australia

Improved Position in 1950–51

COMMISSIONING of the first boiler at Osborne "B" power station designed to operate wholly on Leigh Creek fuel (or alternatively on New South Wales coal) eased the electricity supply position in South Australia last year and no restrictions were necessary. This was the first time since the formation of the Electricity Trust of South Australia in 1946 that the fuel position had enabled the electricity demand to be entirely met. Greater use will continue to be made of Leigh Creek coal, but the Trust's chairman (Mr. F. C. Drew, C.M.G.) adds a caution that unless imports of black coal can be considerably increased it may be impossible to avoid some curtailment of electricity supply, which is still basically dependent on this fuel.

Concern is also expressed at the rise in fuel costs in spite of a Commonwealth subsidy to meet the higher price of imported coal and a £200,000 grant from the South Australian Government for the Leigh Creek operations. N.S.W. coal cost, on the average



Map of rural distribution system showing main transmission lines

£4 7s 7d a ton in June, 1951, compared with £3 12s in 1950, an increase accentuated by declining calorific value.

At the Trust's Osborne "A" and "B" stations 549·6 million kWh was generated last year against 438·9 million in 1949-50, "country" stations producing a further 13·5 million kWh (7 million). Sales were up by 27 per cent, at 463·6 million kWh, but the comparison is affected by restrictions brought about by a strike in the N.S.W. coalfields in the previous year. Thermal efficiency at the "B" station remained among the highest in Australia, at 24·1 per cent (on kWh generated).

The rate of connection of new consumers was accelerated—8,677 last year against 6,699 in 1949-50—in addition to which 1,786 were transferred with undertakings purchased by the Trust. At the end of June last there were altogether 154,959 consumers whose average consumption during the year was 2,992 kWh (domestic, 1,341 kWh). A slight decrease in the installation of new domestic electrical appliances is attributed not to lessening demand, but to delay in wiring and lag in plumbing work.

Plant capacity at the Osborne stations aggregated 139,000 kW, including 60,000 kW at the "B" station, the capacity of which will be raised to 180,000 kW when the four sets and eight boilers ordered are installed. A new power station is under construction at Port Augusta, for which three turbo-alternators and four boilers have been ordered; a jetty is being built so that the plant can be unloaded directly from the ocean-going ships. Immediately to the north another major station designed to burn Leigh Creek coal only is contemplated; the final decision is dependent upon the amount of fuel that can be economically recovered from that coalfield. A start was made during the year on a smaller station, at Port Lincoln, for both diesel and steam plant, and a project for a station in the south-east to burn hogged fuel from a proposed timber mill is being investigated.

Shortage of several types of material hampered work on transmission and distribution extensions. First, steel was the main difficulty: the Trust's general manager (Mr. R. H. M. Lea) paid a visit to England and the Continent as a result of which, states the report, "supplies are forthcoming in such quantities that steel is not at present a major factor affecting the construction programme as it has been previously." Steel scarcity and cement shortage were followed by the problem of obtaining sufficient copper, and in some places after poles had been erected the lines could not be completed for lack of conductors.

Ships' Motors

Commentary on A.C. Commutator Machines

THE suitability of polyphase commutator motors for use in a.c. ships is the subject of a paper submitted by Mr. J. E. Parton (Glasgow University) to the Institution of Engineers and Shipbuilders in Scotland.

After a brief historical introduction the author deduces the principles of the speed control of such machines by first considering the d.c. shunt motor speed controlled by armature voltage. The characteristics of the three main types, namely, the stator-fed shunt and series motors and the rotor-fed Schrage motor, are next considered and their technical limitations indicated.

The paper reviews the land applications of commutator motors and then explores briefly the possibilities of their use in a.c. ships. The author concludes from his examination of the subject that a.c. commutator motors can be used successfully for cargo winches as well as for boiler fans and compressors; indeed, he believes they can be used anywhere else where a variable speed drive is an absolute necessity as distinct from a convenience.

First cost, which may at present militate against the employment of these machines, should with a sufficient demand and more experience be reduced. Even nowadays their first cost is said to be (*a*) considerably less than that of the four-speed a.c. winch motor developed in the United States, (*b*) less than that of d.c. winches driven individually by Ward-Leonard sets (spot conversion) and (*c*) slightly greater than that of d.c. winches driven by a central motor generator set (bulk conversion) which of course would require an (undesirable) additional d.c. distribution system if the vessel were intended to be an a.c. ship.

A selected bibliography of 45 references to the subject is included and the appendices contain theoretical treatments of the three types of machine based on approximate equivalent circuits; also quantitative examples, with worked out current-loci for the shunt and series types.

NEXT WEEK'S EVENTS

Monday, 21st April

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. "The Electron Microscope," by R. S. Page.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Address by the President, Sir John Hacking.

READING.—George Hotel, King Street, 7 p.m. Institution of Electrical Engineers. District meeting. "Electricity in Large Buildings with particular reference to Post Offices and Telephone Exchanges," by A. E. Penney.

SHEFFIELD.—The University, 6.30 p.m. I.E.S. Sheffield Centre. Presidential address.

Monday, 21st and Tuesday, 22nd April

DROITWICH SPA.—Chateau Impney. Association of Electrical Machinery Trades. Annual convention.

Tuesday, 22nd April

GLASGOW.—Royal Technical College. I.E.E. Scottish Centre. Faraday Lecture on "Sound Recording—Home, Professional, Industrial, and Scientific Applications," by Dr. G. F. Dutton.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.30 p.m. I.E.E. North Midland Utilization Group. "The Economic Basis of Battery-Electric Road-Vehicle Operation and Manufacture," by H. W. Heyman.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "An Analogue Computer for Use in the Design of Servo Systems," by E. E. Ward. "The Design and Testing of an Electronic Servo-Simulator for a Hydraulic Remote Position-Controller," by F. J. U. Ritson and P. H. Hammond.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Electricity and Productivity," by C. T. Melling.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 5.30 p.m. Institute of Fuel. "Recent Developments in Instruments," by E. C. Klepp.

Wednesday, 23rd April

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "The Design of High-Voltage High-Power Mercury-Arc Convertors," by Dr. Ing. H. von Bertele.

I.E.E. London Students' Section, 2.15 p.m. Visit to Johnson, Matthey & Co., Ltd., Hatton Garden, E.C.1.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1. Institute of Fuel. 4.30 p.m. Annual meeting. 5.30 p.m. Presidential address on "Fuel Technology and Civilization," by Dr. G. E. Foxwell.

Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. "Explosives for Increased Production," by L. W. Barratt and S. T. Stevens.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. Women's Engineering Society, Manchester Branch. "Transport of Heavy Electrical Plant," by A. Mycoe.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. Annual general meeting. "Electrical Control of Dangerous Machinery and Processes, Part II, Electrically Interlocked Guards on Machines, and Part III, Remote Supervisory Control," by W. Fordham Cooper.

SOUTHSEA.—Royal Beach Hotel, 6.30 p.m. I.E.E. Southern Centre. Discussion on "The Place of Electricity in a National Fuel Policy," opened by D. P. Sayers.

Thursday, 24th April

ABERDEEN.—Music Hall. I.E.E. North-East Scotland Centre. Faraday Lecture on "Sound Recording—Home, Professional, Industrial, and Scientific Applications," by Dr. G. F. Dutton.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Kelvin Lecture. "Iron Atoms in the Service of the Electrical Engineer," by Sir Charles Goodeve.

Connaught Rooms, W.C.2, 12.30 for 1 p.m. Institute of Fuel. Annual luncheon. Principal guest, Sir John Hacking.

Connaught Rooms, 3 p.m. British Electrical & Allied Manufacturers' Association. Annual general meeting.

NEWCASTLE-ON-TYNE.—County Hotel, Neville Street, 6 p.m. Engineers' Guild, Northern Branch. "Law," by N. McQueen.

Friday, 25th April

BIRMINGHAM.—Birmingham Electric Club, 8.30 a.m. Summer visit to Elan Valley Waterworks.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "The Teaching of Transients and the Use of Operational Methods," opened by Instr.-Cdr. D. K. McCleery, and Dr. H. Tropper.

Palmerston Restaurant, Bishopsgate, E.C.2, 6 for 6.45 p.m. E.P.E.A. Southern Meter Engineers' Group. Annual dinner.

39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. Informal meeting. "Condensed Steam Collection—A New System," by A. J. Simpson.

NEWCASTLE-ON-TYNE.—King's College, 6.30 p.m. I.E.E. North Eastern Students' Section. Annual general meeting.

London Tram Conversion

ON 6th April London Transport carried out the seventh stage of the scheme for converting the tramways to bus operation. This stage consisted of the withdrawal of the remaining Kingsway Subway trams and marked the end of trams in North London as well as in Brixton, Brockley, Forest Hill and Norwood. The total route mileage of tramways so far abandoned is 73 (144·7 single track miles), leaving 28·7 route miles (57 single track miles).

Switchgear Factory Extension

Meeting the Demand for Heavier l.v. Units

WITH the primary object of meeting the increased demand for the heavier patterns of low voltage switchgear, Bill Switchgear, Ltd., has recently opened an extension comprising 18,000 sq ft of floor area, adjoining its main factory in Aston Lane, Perry Barr, Birmingham. This marks yet another stage in the progress of the company which now claims to be the second largest manufacturer of l.v. switchgear in the country.

Founded in 1906 with the title of S. Bill & Co., the company occupied works in Guest Street, Hockley, Park Road and Queen's Road, before opening the Aston Lane factory in 1936. The name of the company was changed to its present style in the following year. Since then various other steps have been taken to widen the company's activities and build up a self-sufficient organization.

In 1949 the company entered the small accessories market with the manufacture of 15 A and 5 A plugs, sockets, switch plugs, etc., and already plans are well advanced for the extension of the range to include the new 13 A range. These are at present being made in a subsidiary factory in Victoria Road, Aston, but by August it is hoped that production will be supplemented by a new factory now being erected in John Street. A subsidiary works, engaged mainly on the assembly of the "Vertex" range of ironclad distribution boards, has also been acquired in Slade Road, Erdington. A third sub-factory at Sutton Coldfield is engaged primarily on the sub-assembly of domestic type fuseboards up to 30 A.

In addition the Bill Group includes two subsidiary companies: N. Moore, Ltd., who are responsible for the entire manufacture of all turned parts used in the complete range of switchgear; and Lampert Productions, Ltd., who make all the wooden accessories required, such as cases, boxes, fuseboards, etc. Besides catering for the needs of the group, these subsidiaries also supply outside customers. The organization also has interests in several other companies which supply it with various components.

Several minor extensions have been carried out at the Aston Lane Works since 1936 and the new extension just completed, Block "B" as it is called, will bring the production area available there to about 80,000 sq ft, involving an increase in the number of employees to about 750. Unlike the original building, which is of single-storey construction, the new block is, because of the site restrictions, arranged on three floors served by a 30 cwt goods lift. Because of the need to maintain production the final layout of the extension, which will aim as far as possible on achieving a flow of

Production line in the porcelain assembly department

Assembling fuse units

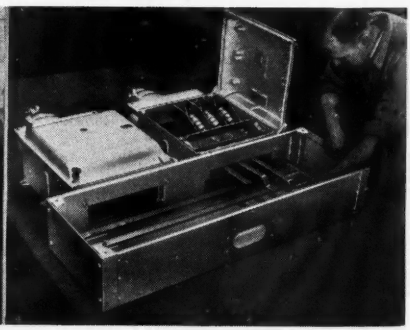
production in logical sequence from one end of the factory to the other, has not yet been practicable but it is already possible to see most of the operations which will be carried out there eventually.

The work undertaken is mainly in connection with the production of the "Imperial" h.r.c. fuse-switches, the "Super K" range of switches and switch fuses and the "Royal" pattern units from 60 to 500 A. At present part of the ground floor is used for drilling, tapping and similar repetition work carried out on single- or multiple-spindle machines all of which are individually electrically driven. All the components produced are gauged here before passing on to the assembly points. The remainder of this floor is occupied by the home and export packing departments, at one end of which is a switchboard, made up of the company's own equipment, to serve the whole of the new building.

The bulk of the output of the ground floor goes to the floor above, the porcelain assembly department, which is engaged mainly on switch assemblies and fuse units, including cooker switches. Jig assembly is employed throughout and transfer from one process to the other is facilitated by a double conveyor system. Assembly of heavy switch and distribution gear is undertaken on the top floor.

Besides making possible an expansion of the company's range of equipment to meet the general demands of the trade, the new building is also permitting the rearrangement and re-equipment of the old works on up-to-date lines. The installation of two stove enamelling ovens is among the innovations already completed.

Left: **500 A "Imperial" switch fuses in course of construction.** *Right:* **Assembling a switch panel comprising a busbar chamber and switch fuse**



The Malayan Market

Predominance of British Goods

MALAYA is a good market for United Kingdom goods, ranging from the capital equipment for industry and communications to the many varieties of consumer goods normally required by a mixed European and Asian population and to supply the considerable entrepôt trade with the neighbouring territories of Indonesia, Borneo, Thailand and Burma. The development of secondary industries has only just begun and is not likely to proceed fast for want of electric power, adequate supplies of coal of good quality, and raw materials. The Malayan market is traditionally one for British goods, and provided that they are competitive there is nearly always a preference for them.

Domestic Appliance Trade

In a survey of the market and conditions generally in Malaya and Singapore, covering the year 1950,* Mr. K. E. Mackenzie, United Kingdom Trade Commissioner in Malaya, says, in dealing with electrical imports, that electric fans and regulators came almost entirely from the United Kingdom, which also had most of the trade in domestic fittings and appliances. The market is not normally large because servants are easy to get; lamps, irons and stoves are in demand, but these are restricted to the wealthy classes. With the recent increase in earnings from rubber and tin many more people now buy this equipment. Plastic table lamps from Australia are popular. Electric lamps came from the United Kingdom and the Netherlands, imports from the latter having increased remarkably. Electric wires and cable were nearly all from Britain, although increasing competition from Germany and Japan is making itself evident. Good supplies of domestic electric refrigerators of the right kind from the United Kingdom entered Malaya in 1950. The market is an excellent one and United Kingdom manufacturers should pay it the greatest possible attention.

The trade in radio receivers shows a remarkable recovery in imports from the Netherlands. In 1948 the United Kingdom enjoyed 77 per cent by value of the market and the Netherlands 16 per cent. By 1950 the Netherlands' share was 36 per cent and the British had fallen to 61 per cent (18,000 sets). Other wireless apparatus and telegraph and telephone equipment is purchased almost entirely from the United Kingdom.

Nearly all of the electrical machinery has come from the United Kingdom, except for a small quantity of generators and small motors which have been supplied by the United States. A substantial amount of heavy equipment is on order in the United Kingdom for the new power stations in Singapore and at Klang in the Federation of Malaya. Old turbines have been sent to Britain from Singapore and Kuala Lumpur for repairs. There is a serious shortage of electric generating capacity in Malaya owing to delays in bringing new stations into operation. At the same time there has been some reluctance, because of the extra generating cost per kWh, to install small generating sets to meet the shortage of power until the large new stations are ready. There were large deliveries of boilers and boiler-house plant from the United Kingdom.

Electricity Supply Position

The normal system of electricity supply in Malaya is a.c. 400 V, 3-phase, 4-wire, 50 cycles, except for a few places where a d.c. system still remains.

As a result of the "scorched earth" policy during the Japanese invasion much damage was done to generating plants throughout the country. Further disorganization and deterioration of prime movers and distribution systems took place during the occupation, due mainly to shortages of lubricating oil, transformer oil and copper wire. Altogether 60 per cent of the pre-war plant capacity was rendered unusable. On the resumption of civil government it was found that in all the

* "Economic and Commercial Conditions in the Federation of Malaya and Singapore" (H.M. Stationery Office, 6s 6d net).

main areas of population the demand for electricity greatly exceeded the supply; and although the position has improved in many areas the shortage is still acute, particularly for tin mines and industries in Selangor. Present shortage of generating capacity in the country would appear to be of the order of at least 120,000 kW.

A new power station is in course of erection at Connaught Bridge, Klang, near Kuala Lumpur. It is expected that 40,000 kW will be available by the end of 1952 and a further 40,000 kW by 1954. A number of 1,000 kW diesel generating sets have been ordered to help overcome the immediate shortage of supply. The hydro-electric possibilities in the Cameron Highlands are being investigated. The main proposal is to supply water power, in two stages, to two high-head power stations with an ultimate combined capacity at normal flow of 100,000 kW. The maximum capacity of the first stage would be 40,000 kW and that of the second stage 60,000 kW.

Financing Development

In 1949 the functions of the Electricity Department of the Government were absorbed by an autonomous self-financing commercial body known as the Central Electricity Board. This change was effected primarily to make the new Board eligible for financial assistance from the Colonial Development Corporation which is advancing $30·7 million to the Board for electrical development in Malaya; in the next few years a further $125 million will have to be borrowed to finance the completion of Connaught Bridge and the provision of a Malayan grid system. The Board will be responsible also for the development of the grid scheme. For the present, the Perak Hydro-Electric Power Co., and Huttenbachs, Ltd. (who supply electricity to towns in Kedah and Province Wellesley) have not been absorbed by the Board. The Crown Agents for the Colonies are the agents of the Board for the purchase of supplies in the United Kingdom.

According to the first annual report of the Central Electricity Board, 550 million kWh was used throughout the Federation in the year ended 31st August, 1950, of which 79 per cent was supplied by public undertakings. Of the total of 432 million kWh supplied by the public undertakings, 72 per cent was consumed by tin mines and dredges. Only 12 per cent of the total output of the Federation is used for lighting and domestic power and 9 per cent for small industry and commercial use.

In Singapore it is hoped that the first 25,000 kW set for a new power station being erected at Pasir Panjang will be in operation by the end of 1952. This station is designed to have ultimately a total capacity of 150,000 kW. The generating plant will be steam turbine driven, comprising six 25,000 kW sets, and there will be nine 187,500 lb/hr boilers. The present St. James' station is now operating at its full capacity, the output in 1950 being 186·8 million kWh, which when compared with the output of 61·7 million kWh in 1940 shows the strain under which the station has been working in recent years. The total plant capacity of this station is 37,000 kW.

Swiss Electrical Industry

SEEN as a whole, the important Swiss electrical equipment industry has more orders on hand now than twelve months ago, although various countries which had been good customers in recent years are buying less on account of foreign exchange difficulties. The "Review of Economic Conditions in Switzerland during 1951," published by the Crédit Suisse, one of the country's leading banks, says that business is good, particularly in the heavy machinery sector, which operates with long delivery terms and commands a substantial volume of domestic orders.

In value, exports of the electrical equipment industry aggregated 310 million francs in 1951, about 13 per cent more than in the previous year. Comparison by weight shows an even higher proportional increase, indicating that the expansion of exports was not due to higher prices. Actually, business done consisted chiefly in the execution of orders received before world market prices rose again.

Deliveries of heavy machinery to foreign countries increased by 25 per cent, while exports of electric locomotives declined—a tendency which is likely to continue for the next few months. Quantitatively, shipments abroad of control devices were also smaller than in 1950. Demand for smaller electrical appliances and motors, which, until the summer, was about the same as in the corresponding period of the previous year, weakened towards the autumn.

The task of procuring supplies of certain scarce raw materials and semi-manufactured goods, especially copper and dynamo sheets, proved to be very difficult at first, not only because of soaring prices, but also because supplying countries granted the necessary export permits very hesitatingly.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 28th May from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

21[illegible]. Marconi's Wireless Telegraph Co., Ltd.—Television and like pick-up or camera tubes. 20th August, 1946. (672962.)

1947

58[illegible]. Philco Corporation.—Super-regenerative receivers. 28th February, 1947. (672862.)

58[illegible] and 5825, 5990 and 5991.—Philco Corporation.—Radio ranging systems. 3rd March, 1947. (672863/6.)

14[illegible]6. Philco Corporation.—Adjustable mountings for use in projection type optical systems. 30th May, 1947. (672965.)

15[illegible]. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Television transmitting tubes. 9th June, 1947. (672765.)

16[illegible]9. Standard Telephones & Cables, Ltd.—Magnetrons. 24th June, 1947. (672766.)

17[illegible]5. British Thomson-Houston Co., Ltd.—Radiographic technique. 27th June, 1947. (672868.)

18970. General Electric Co., Ltd., and Clack, B. N.—Responsive devices associated with electric vapour-filled discharge devices. 15th February, 1950. (672869.)

19181. British Thomson-Houston Co., Ltd.—Radio locating equipment. 21st July, 1947. (672666.)

20671. Battelle Development Corporation.—Electrophotography. 30th July, 1947. (672767.)

26365. Payne, E. M., and Barrett, L. H.—Magnetic sound recording or reproducing apparatus. 8th September, 1948. (672768.)

32340. Radio Corporation of America.—High-frequency electron-discharge device and circuit. 8th December, 1947. (672770.)

1948

1750. Telefon Fabrik Automatic Aktieselskabet and Ungar, E.—Electrical systems for automatically-registering time and date. 20th January, 1948. (672772.)

7121. Raibourn, P.—Method and apparatus for producing a film record of a scene appearing on a television screen. 8th March, 1948. (672877.)

8934. MacDermid, P.—Control apparatus for a.c. slip-ring induction motors. 2nd March, 1949. (672773.)

16244. Akt.-Ges. Brown, Boveri & Cie.—Arrangements for accelerating electrons and ions. 16th June, 1948. (672670.)

25610. Vackar, J.—Method and apparatus for measuring the volume of higher-harmonic frequencies in alternating current. 1st October, 1948. (672677.)

29025. General Electric Co., Ltd., McKeag, A. H., and Ranby, P. W.—Manufacture of luminescent materials. 3rd November, 1949. (672883.)

30933. Metropolitan-Vickers Electrical Co., Ltd., and Kelsall, R. H.—Speed control systems for direct current motors. 5th December, 1949. (672686.)

30934. Metropolitan-Vickers Electrical Co., Ltd., Shalib, S. A., Kelsall, R. H., and Parr, R.—Control systems for direct current motors. 5th December, 1949. (672687.)

31161. Watford Electric & Manufacturing Co., Ltd., Kilby, C. E., and Craven, R. A. F.—Eddy-current switches for controlling electric motors. 26th October, 1949. (672778.)

32195. Electronic Tubes, Ltd., and Woodbridge, L. A.—Cathode-ray tubes. 15th February, 1950. (672779.)

1949

[illegible]. Radio Corporation of America.—Oscillator arrangements operated by recurrent pulses. 13th January, 1949. (672888.)

1427. McCarthy, P. M.—Distribution boxes and switch-fuses in fuse-protected electrical circuits. 18th January, 1950. (672692.)

1516. British Thomson-Houston Co., Ltd.—Wall cooling arrangements for combustion chambers. 19th January, 1949. (672780.)

4726. British Broadcasting Corporation, and Bliss, J. L.—Television cameras. 21st February, 1950. (672895.)

5846. British Thomson-Houston Co., Ltd., Craick, W., Milne, K., and Taylor, H. B.—Radiators for ultra high-frequency electromagnetic energy and apparatus embodying the same. 2nd March, 1950. (672976.)

8096. General Electric Co., Ltd.—Luminescent materials. 9th March, 1950. (672697.)

8265. Electric & Musical Industries, Ltd.—Electron-discharge devices employing hollow resonators. 27th March, 1950. (672785.)

9622. Byer, H. E.—Direct contact condensers. 8th April, 1949. (672909.)

10353. British Thomson-Houston Co., Ltd.—Electric discharge devices. 19th April, 1949. (672978.)

11052. King, H. W. M.—Busbar or like current conducting assemblies. 14th April, 1950. (672702.)

12484. Stone & Co., Ltd., J., and Nixon, L. R.—Switch devices, particularly for fluorescent lighting. 24th March, 1950. (672788.)

12564. Philips Electrical, Ltd.—Mixing or detector circuits incorporating cathode-ray tubes. 11th May, 1949. (672979.)

13210. Electric & Musical Industries, Ltd.—Electromagnetic sound recording or reproducing apparatus. 18th May, 1950. (672981.)

13550. Holophane, Ltd., English, S., and Holmes, J. G.—Luminaires. 19th May, 1950. (672924.)

14796. National Research Development Corporation.—Phase-sensitive rectifiers. 1st June, 1950. (672927.)

14895. Chadburns (Liverpool), Ltd., and Brewerton, A. E.—Electrically-operated indicating, telegraph and like instruments. 5th June, 1950. (672710.)

15644. Kaelin, P.—Telephone set with a device for composing call-signs. 13th June, 1949. (672983.)

15956 & 16075. British Thomson-Houston Co., Ltd.—Control of a sequence of operations particularly of electrical washing machines. 15th & 16th June, 1949. (672713 & 672933.)

15963. General Electric Co., Ltd., and Nettleship, T. G. P.—Systems of control for electrical apparatus. 3rd May, 1950. (672931.)

16104. General Electric Co., Ltd., Mawson, R., and Noakes, W. F.—Electrical resistors. 16th June, 1950. (672984.)

16714. British Thomson-Houston Co., Ltd.—Electric flat irons having thermal cut-outs. 23rd June, 1949. (672717.)

17177. Cinema-Television, Ltd., and Freeman, G. S. P.—Television pick-up tubes. 26th June, 1950. (672794.)

17486. British Thomson-Houston Co., Ltd.—Electric heating and cooking devices particularly waffle irons. 1st July, 1949. (672796.)

18529. Amplivox, Ltd.—Bone conduction telephones. 13th July, 1949. (672722.)

19048. Honorary Advisory Council for Scientific & Industrial Research, Carmichael, H., and Salmon, P. G.—Electroscopes. 19th July, 1950. (672944.)

19113. Philips Electrical, Ltd.—Electron-discharge tubes. 20th July, 1949. (672724.)

19629. Pye, Ltd., and Weighton, D.—Television apparatus. 28th September, 1950. (672949.)

20468. General Electric Co., Ltd., and Cranston, W. M. —Dynamo-electric machines. 4th August, 1950. (672800.)

20929. Dehn, S. G. (Automatic Electric Laboratories, Inc.).—Carrier terminal equipment. 11th August, 1949. (672729.)

22203. Standard Telephones & Cables, Ltd.—Electric current rectifiers. 25th August, 1950. (672732.)

22570. Chloride Electrical Storage Co., Ltd.—Electric accumulators. 30th August, 1950. (672733.)

23187. Smith & Sons (England), Ltd., S.—Automatic control systems for aircraft. 7th September, 1950. (672735.)

25509. Parmiter, Hope, & Sugden, Ltd.—Electrical fuses of the bi-metallic type. 22nd September, 1950. (673002.)

25608. Esser, P. (trading as Meyer, Roth & Pastor).—Electric resistance chain welding machines. 5th October, 1949. (672807.)

26821. Diamond H Switches, Ltd.—Rotary cam actuated electrical switches. 16th October, 1950. (672740.)

26972. British Thomson-Houston Co., Ltd.—Heating-circuit controls for electric ranges. 20th October, 1949. (672809.)

28689. Crabtree & Co., Ltd., J. A., Crabtree, J. A., and Morgan, R. W.—Shielded electric sockets. 6th November, 1950. (673010.)

29680. Compagnie des Freins et Signaux Westinghouse. —Frequency mixing arrangements employing crystal rectifier elements. 21st November, 1949. (673012.)

29778. British Messier, Ltd.—Control systems for hydraulic, pneumatic or electric motors. 19th October, 1950. (672748.)

30593. Recherches et Industrie.—Short wave electro-magnetic radiation catoptrics. 29th November, 1949. (672816.)

30739. British Thomson-Houston Co., Ltd.—Clothes-washing machines. 30th November, 1949. (672751.)

31457. Crabtree & Co., Ltd., J. A., Carding, J. T., and Wintle, T. D. G.—Protection of delta-wound electric motors. 20th November, 1950. (672752.)

31990. British Thomson-Houston Co., Ltd.—Clothes wringers. 13th December, 1949. (673021.)

32544. Radio Corporation of America.—Thermionic vacuum tubes. 19th December, 1949. (673024.)

32602. English Electric Co., Ltd.—Safety devices for internal-combustion engines operating in a group. 15th December, 1950. (673025.)

32662. Martin, C.—Electronic musical instruments. 20th December, 1949. (673027.)

1950

694. Ashley Accessories, Ltd., and Everitt, L. H. R.—Dolly-operated electric switches. 11th January, 1950. (672756.)

1131. Compagnie Générale del Télégraphie sans Fil.—Electric oscillators. 16th January, 1950. (673033.)

1196. Philips Electrical Industries, Ltd.—Circuit arrangements for amplifying high-frequency electrical oscillations. 17th January, 1950. (673034.)

2550. Staatsbedrijf der Posterijen, Telegrafie en Telefonie.—Arrangement for the control of a selector without a home position in a marking system. 31st January, 1950. (673038.)

5477 & 6055. Mallory & Co., Inc., P. R.—High-frequency variable inductance tuning devices. 3rd & 10th March, 1950. (672830/1.)

7729. British Thomson-Houston Co., Ltd.—Electrical heating panels. 28th March, 1950. (672835.)

12545. General Motors Corporation.—Control system for effecting synchronization and like operations. 19th May, 1950. (672845.)

12580. Standard Telephones & Cables, Ltd.—Two-way communication systems between two facsimile transceivers. 19th May, 1950. (673041.)

12961. Bosch Ges., R.—Regulating and switch apparatus for electrical current generators. 24th May, 1950. (672846.)

13894. Cinch Manufacturing Corporation.—Holders for thermionic valves and like electrical devices having projecting terminal prongs and contacts for such holders. 2nd June, 1950. (672848.)

18566. British Thomson-Houston Co., Ltd.—Electric ranges. 25th July, 1950. (672855.)

22058. Philips Electrical Industries, Ltd.—Cathode-ray tubes. 7th September, 1950. (672672.)

22117. Decca Record Co., Ltd.—Radio range-indicating systems. 7th September, 1950. (673050.)

26570. Evershed & Vignoles, Ltd. (Biddle & Co., I. G.).—Electrical measuring instruments. 31st October, 1950. (673052.)

28558. British Thomson-Houston Co., Ltd.—Rotary pumps. 22nd November, 1950. (673056.)

31583. Standard Telephones & Cables, Ltd.—Simultaneous control system for a plurality of picture signal characteristics. 29th December, 1950. (673059.)

31591. Rauland Corporation.—Fluorescent screens for cathode-ray tubes and methods of manufacturing such fluorescent screens. 29th December, 1950. (673060.)

1951

9642. McCarthy, P. M.—Fuse protected electrical pin plugs. 18th January, 1950. (672699.)

12276. Watford Electric & Manufacturing Co., Ltd., Kidby, C. E., and Craven, R. A. F.—Eddy-current switches for controlling electric motors. 26th October, 1949. (672859.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 2nd May:—

TELMA. No. 701,709. Class 7. Electro-dynamic brakes or retarders for machines; and parts thereof included in Class 7 not consisting of or containing rubber or gutta-percha. TELMA. No. 701,710. Class 12. Electro-dynamic brakes or retarders for vehicles; and parts thereof included in Class 12 not consisting of or containing rubber or gutta-percha.—Electro-Mechanique de l'Aveyron, Paris, France. Address for service, c/o Forrester, Ketley & Co., Jessel Chambers, 88–90, Chancery Lane, London, W.C.2.

CASCAP. No. 702,793. Class 9. Capacitors and transducers, all being electrical apparatus made wholly or principally from ceramics.—Plessey Co., Ltd., 56, Vicarage Lane, Ilford, Essex.

B.R.S. LTD. (design). No. B697,062. Class 9. Aerials, masts and insulated cable, all for use in television reception. —Belcher (Radio Services), Ltd., 57, Windsor Road, Slough, Bucks.

ENFO. No. 699,684. Class 9. Electric accumulators, ammeters, electric batteries, ignition coils, commutators, condensers, connectors, cut-outs, distributors and parts thereof included in Class 9, lenses, pressure gauges, liquid gauges, electric junction boxes, speedometers, switches, insulated electric wire and wireless telephone receiving apparatus for land vehicles.—Ford Motor Co., Ltd., 88, Regent Street, London, W.1.

BRUSH (design). No. 674,910. Class 12. Battery-driven electric vehicles.—Brush Electrical Engineering Co., Ltd., Falcon Works, Nottingham Road, Loughborough.

Cost Accountancy Publications

THE Institute of Cost and Works Accountants has published "Terminology of Cost Accountancy" (2s 6d) to replace "Costing Terminology" which it produced fifteen years ago. There has been extensive revision and re-arrangement. Another publication of the Institute is "The Accountancy of Changing Price Levels" (15s). This suggests methods of dealing with the finances of a business in the face of rising costs and inflated replacement values. An abridged version (2s 6d) for those who are concerned with the problem but not its details is also available. These publications are obtainable from Gee & Co. (Publishers), Ltd., 27–28, Basinghall Street, London, E.C.2.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bedfordshire.—Education Committee. Installation of electric lighting, etc., in Ampthill-Flitwich School. (See this issue.)

Belgium. — BRUSSELS.—23rd April. Belgian State Railways. Rectifiers for automatic telephone exchanges. (C.R.E. 12191/52. Ten/3815.)*

Bournemouth.—30th April. Town Council. Re-wiring of the electrical installation at the County Secondary Boys' School, Portchester Road (Deposit: £1 1s). Borough architect, Room 101, Town Hall.

British East Africa. — NAIROBI. — 28th April. City Council. Two 30 kW hydro-turbine generators and one 35 kW diesel generator, together with switchgear and cabling for the Chania—Sasumua water supply scheme. (C.R.E. 12787/52. Ten/3821.)*

India.—NEW DELHI.—28th April. Directorate General of Supplies and Disposals. Supply of 900 miles of aluminium steel reinforced conductors and accessories, for a 33 kV transmission line. (C.R.E. 11988/52. Ten/3802.)*

London.—HAMMERSMITH.—24th April. Hammersmith, West London and St. Mark's Hospitals Board. Supply of electric lamps. (See this issue.)

Pakistan.—KARACHI.—23rd May. Director-General, Railways, Railway Division, Ministry of Communications. Supply of 18 diesel electric locomotives and two inspection diesel rail cars. (C.R.E. 11766/52. Ten/3813.)*

Portugal.—LISBON.—30th April. Directorate General of Hydraulic Services. Construction of the catchments, conduits, and buildings for the power stations of the hydro-electric and hydro-agricultural schemes of the island of Terceira. (C.R.E. 13118/52. Ten/3823.)*

Sunderland.—3rd May. Corporation. Electrical installations in 360 houses on Farringdon Estate. (See this issue.)

Uruguay. — MONTEVIDEO. — 16th May. Administracion General de las Usinas Electricas y Telefonos del Estado. Supply of insulated copper conductors. (C.R.E. 12611/52. Ten/3806.)*

Wiltshire.—30th April. County Council. Lighting installation at Fugglestone Cross-Roads, Wilton. (See this issue.)

Worcestershire.—1st May. County Council. Electrical installation in proposed new secondary modern school, Evesham. (See this issue.)

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

ORDERS PLACED

Bradford.—Education Committee. Electrical installation works at Lapage Girls' and Infants' School (£833).—Roberts & Jowett, Ltd.

Cheltenham. — Housing Committee. Electrical installations in houses under Scheme No. 6, Arle and Hesters Way estate (£1,921).—J. Hearson & Co.

Dagenham.—Corporation. Electrical installations, contract C, Woodlands estate (£1,342).—Eastern Electricity Board.

Hull.—Corporation. Telephones Committee. Supply of 8¾ miles of cable, various sizes (£6,695).—Standard Telephones & Cables, Ltd.

Newcastle-on-Tyne.—Education Committee. Electrical installation at Kenton Lodge training college, Newcastle (£777).—Falconar, Cross & Co., Ltd.

Newcastle - under - Lyme. — Corporation. Electrical installations in 22 houses, Seabridge Lane (£488).—T. L. Whitley & Co., Ltd.

Walsall. — Property Committee. Rewiring the Guildhall and police offices (£3,388).—Birch & Evans.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Houses at Embleton, Glanton and Longhoughton for R.D.C.; Reavell & Cahill, architects, Lloyds Bank Chambers, Alnwick.

Barking.—Additions to match works, for J. John Masters & Co., Ltd.; A. Glenny & Sons, architects, 53, East Street, Barking.

Barnack (Northants).—Primary school for R.D.C.; Ruddle & Wilkinson, architects, Longcauseway Chambers, Peterborough.

Basingstoke.—Extensions to factory; Van Moppes & Sons, Ltd., Winchester Road.

Boldon (Co. Durham).—Houses (38); J. T. Edmondson, surveyor.

Caernarvonshire. — Science laboratory at Llandudnor Grammar School and final instalment of Portmadoc Grammar School (1952 programme); county architect.

Cannock.—Bungalows (34), at Hednesford; S. Harrison, U.D.C. architect, Council House, The Green, Cannock, Staffs.

Carnforth.—Houses (50), Highfield/Kellett Road estate, for U.D.C.; Middleton & Jones, architects, 1, Queen Street, Lancaster.

Crook (Co. Durham).—Pithead baths at Hole-in-the-Wall Colliery for N.C.B.; Architects' Department, Ashfield Towers, Gosforth, Newcastle-on-Tyne.

Dudley.—Houses for Borough Council: G. F. Webb, architect, 200, High Street, Dudley (234 houses) and Bridgewater & Shepherd, 42, Bruton Place, London, W.1 (170 houses).

Durham.—Houses, Framwellgate Moor (100) and Church Street (18); city engineer, Town Hall.

East Grinstead. — Treatment works and pumping station, Forest Row, for Weir Wood Water Board; Herbert Lapworth Partners, contrical installations in proposed offices for the sulting engineers, 25, Victoria Street, S.W.1.

Faversham. — Flats (32), North Preston; borough surveyor, Municipal Offices.

Glasgow.—Extensions to George Cinema, Uddingston, for Associated Cinemas, Ltd., Glasgow; Gavin Paterson & Son, architects, 147, West Regent Street, Glasgow.

Gosforth (Northumberland). — Twenty-six houses in flats at South Gosforth Farm; U.D.C. surveyor.

Hemsworth (Pontefract). — Houses and bungalows (50), Kingsley and Moorshutt sites, for U.D.C.; Pennington, Hustler & Taylor, architects to Council, 45, Ropergate, Pontefract.

Jarrow-on-Tyne. — Bus station, Station Street; Northern General Transport Co., Ltd., Bensham, Gateshead.

Kidderminster.—Additions to carpet works for Brintons, Ltd.; Godwin, Clist & Greenway, architects, Bank Buildings, Kidderminster.

Lancaster.—Houses (42), Leyburn Road; J. Parkinson & Sons, Ltd.

Leamington Spa.—Houses (140) and flats (24); borough surveyor, Town Hall.

Leeds.—Dwellings (240) on estates at Ireland Wood, Moorfield, Moorside, Seacroft, Swinnow and Tinshill; city architect, Priestley House, Quarry Hill.

Lindsey.—Conversion of stables at Riseholme Farm Institute into students' hostel (£20,000); county architect, County Offices, Lincoln.

Liverpool.—Flats (12), Beaumont Street area; Tysons (Contractors), Ltd., Dryden Street, Liverpool. Flats (12), Foley Street; Thomas Rimmer, 14, Nazeby Avenue, Crosby.

Additional accommodation for nurses at Walton Hospital; Wm. Moss & Sons, Ltd., Roscoe Street, Liverpool. Formation of E.N.T. unit at Clatterbridge General Hospital; Stott & Ward, Ltd., 2a, Charlesville, Claughton, Birkenhead.

Loftus (Yorks).—Houses (82), Mars Farm estate, for U.D.C. Builders: J. McCreton, Ltd., Middlesbrough; F. J. Willis, Hinderwell; R. E. Cryer, Saltburn; Harker & Son, Brotton; Theaker & Co., Ltd., Staithes; G. Hebditch, Loftus; and Morrison Brothers, Loftus.

Longbenton.—Houses (70); surveyor, U.D.C., Longbenton, Northumberland.

Longridge.—Houses (30), St. Wilfreds site, for U.D.C.; Pius A. Baines, Ltd., Paley Road, Preston.

Loughborough.—Shops and flats, Thorpe Acre estate; borough architect, Council Offices, Loughborough, Leics.

Luton.—Houses (60), Ramridge estate; H.). Carter, Ltd., builders, Alexander Road, Londo , N.19.

Manchester.—Extensions to factory, Wyth shawe Estate, for Bates Bros., Ltd.; A. V. Book r, architect, 28, Kennedy Street, Manchester.

Extensions to pathological laboratory at Bagu y Hospital for Regional Hospital Board; T. Dut y, architect to Board.

Stage 2 of new school for managers of the Je s School, The Polygon; Taylor & Young, archite s, 195, Oxford Road, Manchester.

New crematorium at Blackley (£80,000); c ty architect.

Middlesbrough. — Houses (28), Berw k Heads estate; borough engineer.

Newcastle-on-Tyne.—Additions to offi es in Pilgrim Street for Newcastle and Gateshead Water Co.; J. Jackson & Sons, builders, C rporation Street, Newcastle.

Newcastle-under-Lyme. — Extensions to shop premises, New Street, for Montague Burton, Ltd.; N. Martin, staff architect, Hudson Road Mills, Leeds.

Northumberland.—Additions to schools at Lowick, North Sunderland and Alnwick; county architect, County Hall, Newcastle-on-Tyne.

Erection of Newburn West Denton County Primary School (£90,000); Curry & Son, Ltd., builders, Meldon Street, Newcastle-on-Tyne.

First instalment of plan for new technical college, Ashington (£200,000); county architect.

Norwich. — Dwellings (172), North Park Avenue estate; city architect.

Oldham. — Church, Limeside estate; R. Partington & Sons, Ltd., Lodge Street, Middleton.

Peterborough. — Houses (80), Dogsthorpe estate; C. W. Shelton, Ltd., 30, Westwood Park Road, Peterborough.

Portsmouth.—Houses (146), Leigh Park; city architect.

Sheffield.—Factory on site in Solly Street; E. S. Shillito, pruning shears manufacturer, 135, Scotland Street, 3.

Houses, Parsons Cross (40) and Manor Park (4); Redmile & Poole, Ltd., Sheffield.

Sittingbourne and Milton. — Dwellings (84), Homewood estate; U.D.C. surveyor, High Street, Sittingbourne.

Smethwick. — Extension scheme, Chance Technical College (£129,351), for T.C.; William Jackson (Langley Green), Ltd., builders, Oldbury.

Trowbridge.—Out-patients' department at District Hospital; Architect's Department, South Western Regional Hospital Board, "Roxburgh," Clifton Down, Bristol.

Uppingham.—Houses (34) and four blocks of two-storey flats, for R.D.C.; Pick, Everard, Keay & Gimson, architects, 6, Millstone Lane, Leicester.

Whitby.—Houses (106) at Mount estate for U.D.C.; C. D. Taylor, 41, Baxtergate, Whitby.

Wigan.—Reconstruction of Newburgh Mills, Parbold; H. & R. Ainscough, corn merchants.

Wolverhampton. — Houses (42), Muchall Manor Farm estate; Wm. Whittingham, Ltd., Powlett Street, Wolverhampton.